

SELECTED

SOURCESRESOURCES ABSTRACTS



VOLUME 5, NUMBER 14 JULY 15, 1972 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 5, NUMBER 14 JULY 15, 1972

W72-07889--08488

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

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Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

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07 RESOURCES DATA

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

PREDICTING SURFACE RUNOFF FROM AGRICULTURAL WATERSHEDS, Iowa State Univ., Ames. Dept. of Agricultural En-

S. W. Melvin, H. P. Johnson, and C. E. Beer. American Society of Agricultural Engineers Transactions, Vol 14, No 3, p 505-510, May-June 1971. 4 fig, 4 tab, 11 ref.

Descriptors: *Runoff forecasting, *Computer programs, Surface runoff, Infiltration, Agricultural watersheds, Water yield, Excess water (Soils), Precipitation excess, Small watersheds, Routing.

A simple infiltration model predicts runoff from mixed cover agricultural watersheds in a deep loess soil region. The surface runoff prediction method is consistent between watershed basins in the study region. The relationship between predicted and observed runoff varied with time during the growing season. Little improvement in runoff prediction could be accounted for by revised multiple regression equations. Runoff predictions are made using FORTRAN computer program. Input data required for each watershed runoff prediction included: (a) storm identification, watershed, date; (b) areal distribution of the three predominate crop cover conditions; (c) precipitation recorded during each of the seven days preceding the storm; and table of time cumulative-precipitation values representing the storm. (Knapp-USGS) W72-08082

HYDROLOGY OF THE GLENN CREEK WATERSHED, TANANA RIVER BASIN, CENTRAL ALASKA,

Cold Regions Research and Engineering Lab., Hanover, N.H. S. L. Dingman.

Research Report 297, September 1971. 112 p. 55 fig, 22 tab, 115 ref.

Descriptors: *Hydrology, *Small watersheds, *Cold regions, *Rainfall-runoff relationships, *Cold regions, *Rainfall-runoff relationships, *Alaska, Streamflow, Evapotranspiration, Per-mafrost, Hydrologic data, Basic data collections, Topography, Geology, Soils, Vegetation, Cli-mates, Storms, Peak discharge, Stream gages, Snow surveys, Precipitation (Atmospheric), Water temperatures, Dissolved solids, Hydrographs. Identifiers: *Tanana River Basin (Alaska), Taiga

The results of a four-summer (1964-1967) hydrologic study of the watershed of Glenn Creek, about 8 miles north of Fairbanks, Alaska, in the Yukon-Tanana uplands physiographic province, are presented. This work was initiated to provide initial base line hydrologic data for a small subarctic watershed. The stream is second-order, and drains an area of 0.70 square mile. Basin elevations are from 842 to 1,618 ft. About half of the 12.3-in. normal annual precipitation is runoff. The remainder is the actual evapotranspiration, which equals only about 30% of estimated potential evapotranspiration. For individual storms, runoffrainfall proportions were from 0.03 to 0.42, and were positively correlated with antecedent discharge of the stream. Peak discharges for individual storms were estimated by an equation in-cluding antecedent discharge, total precipitation and storm duration, and average recession constant. These results represent the first detailed hydrologic data from the discontinuous per-mafrost zone of the North American taiga and should be of significance to the International Hydrological Decade and International Biological Program. (Woodard-USGS) W72-08095 UPPER BEAR CREEK EXPERIMENTAL PROJECT: A CONTINUOUS DAILY-STREAMFLOW MODEL.

Tennessee Valley Authority, Knoxville. Div. of

Research Paper No 8, February 1972. 99 p, 22 fig, 12 tab, 29 ref.

Descriptors: *Streamflow, *Model studies, *Tennessee Valley Authority, *Watershed management, *Streamflow forecasting, Planning, Computer models, Input-output analysis, Hydrologic data, Flow rates, Rainfall-runoff relationships, Sediment transport, Water quality, Potassium, Clear-cutting, Land use. Identifiers: Research project.

A mathematical model of continuous streamflow is described. This development represents one of the major objectives of the Upper Bear Creek Experimental Project which is part of a hydrologic research program in TVA. The model should be a useful tool in water resources management, planning, and research work. There are five prima-ry parameters that must be computed (optimized), ch of which have been linked to watershed mea sures. There are some 11 additional parameters or constants that can be readily determined. The model has reproduced about 85% of the variations of daily flows when compared to observed flows, and can reproduce the monthly and annual flow volumes within close limits of observed flows. To illustrate how the model can be used in waterquality work, examples are provided in which it is used to simulate suspended sediment transport and potassium loads. Another example shows use of the model to detect changes in water quantity and quality attributable to clear-cutting of a forest. And finally, an example is provided wherein relationships developed between watershed measures and model parameters are used to estimate parameters for an ungaged area. (Woodard-USGS) W72-08097

HYDROLOGICAL OBSERVATIONS ON A SMALL ARCTIC CATCHMENT, DEVON ISLAND. McMaster Univ., Hamilton (Ontario), Dept. of Geography.
For primary bibliographic entry see Field 02C.
W72-08187

SYNTHETIC STORM PATTERN AND RUN-OFF FOR GAUHATI, INDIA, Calcutta Metropolitan Planning Organization (In-

M. Bandyopadhyay.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY5, Paper
8887, p 845-857, May 1972. 6 fig, 5 tab, 4 ref, ap-

Descriptors: *Urban hydrology, *Rational formula, *Synthetic hydrology, *Peak discharge, *Rainfall-runoff relationships, Depth-area-duration analysis, Runoff coefficient, Time of concentration, Precipitation intensity, Storm runoff, Cities, Urban drainage, Distribution patterns.

Identifiers: *Gauhati (India).

Factors which are generally not considered in the rational method are the effect of antecedent rainfall as well as the location of peak intensity during the time of concentration. The rainfall intensity duration curve for a particular frequency indicates only average intensity for a given duration corresponding to the time of concentration, which is one of the basic assumptions of the rational method. To determine at what time within the dumethod. To determine at what time within the curration of storm the average intensity is to be applied, knowledge of storm pattern is necessary. Without this, proper application of the rational method is not possible, especially in evaluating the effect of antecedent precipitation. A synthetic storm pattern was calculated from the rate duration. tion curve in the city of Gauhati in Assam, India.

This storm pattern was used for the determination of the runoff coefficient in the rational method. people its ilmitations, the rational method may be improved by considering the synthetic storm pattern for computation of the runoff. Furthermore, it may be applicable to cases where field data are not available. (Knapp-USGS) W72-08198 Despite its limitations, the rational method may be

MATHEMATICAL MODELS OF HYDROLOGIC

SYSTEMS, University Coll., (Ireland). Dept. of Civil Engineering, Dublin (Ireland). Dept. of Civil For primary bibliographic entry see Field 06A. W72-08269

CONCEPTUAL MODELS FOR THE TRANSFORMATION OF PRECIPITATION INTO

Societe Grenobloise d'Etudes et Applications Hydrauliques, Grenoble (France).
For primary bibliographic entry see Field 06A. W72-08271

2B. Precipitation

DEUTERIUM CONTENT OF PEAT AS A PALEOCLIMATIC RECORDER,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab. For primary bibliographic entry see Field 02K.

USE OF RAIN GAGES TO ADJUST RADAR ESTIMATES OF RAINFALL, Center for the Environment and Man, Inc., Hart-

ford, Conn. J. W. Wilson.

Available from the National Technical Information Service as COM-71-01138, \$3.00 in paper copy, \$0.95 in microfiche. Final Report CEM 4098-448, September 1971. 28 p, 9 fig, 2 tab, 5 ref. Contract No. NOAA E22-41-71 (N).

Descriptors: *Rainfall, *Forecasting, *Radar, *Rain gages, *Mathematical studies, Storms, Meteorological data, Data collections, Weather data, Meteorology, Telemetry, Remote sensing. Identifiers: Research project.

A technique was developed for adjusting radar estimates of rainfall utilizing rain gages. The rainfall measurements are possible utilizing only telemetric rain gages and gages located at regularly reporting U. S. Weather Service stations. The gages can be used to help adjust for both average storm-to-storm variations in the echo intensity rainfall rate relationship and within-storm space variations in the relationship. Storm-to-storm adjustments are based on the sum of the calibrating gage measurements divided by the sum of the corresponding radar measurements. An equation was developed for weighting individual gages when making within-storm space adjustments. The weight to give a gage is dependent on the distance of the gage to the area to be adjusted. For radar ranges greater than 70 miles, inverse square law range normalization is inadequate. A curve for making additional range corrections beyond 70 miles is presented. (Woodard-USGS) W72-07973

DIURNAL VARIATION OF SUMMERTIME THUNDERSTORM ACTIVITY OVER THE

UNITED STATES, Environmental Technical Applications Center (Air

Force), Washington, D. C. E. M. Rasmusson. Available from NTIS as AD-724 645, \$3.00 in paper copy, \$0.95 in microfiche. Technical Note 71-4, April 1971. 15 p, 9 tab.

Group 2B—Precipitation

data, *Climatic data, Precipitation (atmospheric), Meteorology, Weather, Weather data, Weather patterns, Climatology, Numerical analysis, Computers, Fourier analysis, Diurnal distribution, Fluctuations.

Identifiers: Numerical modeling.

Observations from 294 Air Force and National Weather Service Stations scattered throughout the United States were used to study the diurnal variation of summertime thunderstorm activity. The length of record was generally 10 years or more. However, a few stations with shorter records were used where required to improve coverage. The results of this study are summarized in isoline frequency charts giving monthly values of the 24 hr mean, the variance of the mean hourly values, hours of maximum frequency, and the phase, am-plitude, and explained variance of the diurnal and semidiurnal harmonics. This work was apparently performed while the author was assigned to NOAA National Weather Service, BOMAP analysis project. (Svensson-Washington) W72-08063

NUMERICAL FORECAST AND ANALYSIS OF HYDROMETEOROLOGICAL FIELDS IN THE ARCTIC (CHISLENNYY PROGNOZ I ANALIZ GIDROMETEOROLOGICHESKIKH POLEY V ARKTIKE). Arkticheskii

i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).

Arkticheskiy i Antarkticheskiy Nauchno-Iss-ledovatel'skiy Institut Trudy, No 291, Leningrad,

Descriptors: *Meteorology, *Arctic, *Forecasting, *Numerical analysis, *Digital computers, Computer programs, Data processing, Data storage and retrieval, Automation, Automatic control, Equations, Model studies, Meteorological data, Atmospheric physics, Ice, Heat flow, Stage-discharge relations, Water level fluctuations, Investigations vestigations.

Identifiers: *USSR, Ice drift, Actinometry, Aerology.

This collection of 18 papers presents results of Arctic hydrologic investigations on (1) numerical methods of analysis and forecast of oceanological fields; (2) numerical methods of analysis and forecast of meteorological fields and problems in atmospheric physics; and (3) application of digital computers to automatic collection, control, and statistical processing of meteorological and aerological data. (Josefson-USGS)

SYNTHETIC STORM PATTERN AND RUN-OFF FOR GAUHATI, INDIA, Calcutta Metropolitan Planning Organization (In-

For primary bibliographic entry see Field 02A. W72-08198

TRACE SUBSTANCES IN RAIN WATER: CON-CENTRATION VARIATIONS DURING CON-VECTIVE RAINS, AND THEIR INTERPRETA-

Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 05A. W72-08240

PROJECT ARID DROP, A SUMMARY REPORT OF CLOUD SEEDING ACTIVITIES IN ARIZONA AS CONDUCTED BY ATMOSPHER-ICS INCORPORATED DURING THE PERIOD 16 JULY-12 AUGUST 1971,

Atmospherics Inc., Fresno, Calif. For primary bibliographic entry see Field 03B. STUDY OF THE RELATIONSHIP OF DRIFT-STUDY OF THE RELATIONSHIP OF DRIFT-ICE FORMATION ON SOME RIVERS OF THE USSR TO ATMOSPHERIC CIRCULATION PROCESSES IN THE NORTHERN HEMI-SPHERE (OPYT ISSLEDOVANIYA SYYAZI POYAVLENIYA PLAVUCHEGO L'DA NA NEKOTORYKH REKAKH SSSR S OSOBEN NOSTYAMI TSIRKULYATSII ATMOSFERY SEVERNOGO POLUSHARIYA).

Gidrometeorologicheskii Nauchno-Issledovatel-skii Tsentr, Leningrad, USSR. For primary bibliographic entry see Field 02C. W72-08426

2C. Snow, Ice, and Frost

PRELIMINARY NOTES ON CHANGES IN ALGAL PRIMARY PRODUCTIVITY FOLLOW-ING EXPOSURE TO CRUDE OIL IN THE

CANADIAN ARCTIC,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05C. W72-07922

SEDIMENTATION IN THE ICE-CONTACT EN-VIRONMENT, WITH EXAMPLES FROM SHROPSHIRE (ENGLAND),

Alberta Univ., Edmonton. Dept. of Geography. For primary bibliographic entry see Field 02J.

RESTUDY OF RED ROCK ICE CLIFF IN NU-NATARSSUAQ, GREENLAND, Cold Regions Research and Engineering Lab.,

Hanover, N.H. R. P. Goldthwait.

Available from NTIS, Springfield, Va. 22151-AD-732 411, Price \$3.00 Paper copy; \$0.95 microfiche. Technical Report 224, August 1971. 27 p, 6 fig, 1 tab, 9 ref, 3 append.

Descriptors: *Glaciers, *Ice loads, *Glacial drift, *Ablation, *Melt water, Vegetation, Topography, Scour, Surveys, Mapping, Hydrologic data, Data collections.

Identifiers: Red Rock Ice Cliff (Greenland), *Glaciology.

A follow-up study of Red Rock Ice Cliff in Greenland, was undertaken in summer 1965 to time-test findings of studies in 1955 and 1956. Work was limited to mapping the ice cliff face and a portion of the ice drainage basin above it and to studying the effects upon vegetation. A total ice loss of 500,000 cu m/year was calculated for the small 2.2 sq km ice drainage basin whose surface dropped 5 m in a decade. Five regions, totaling 6% of the 1 sq km mapped, dropped 8 m or more. Ice loss from the ice cliff decreased from about 2% to less than 1% due largely to a 30% reduction in the area of exposed cliff. The overall position of the cliff remained unchanged. There was less difference in cliff face detail in the two July maps ten years apart than in the several maps over one season. From a comparison of the positions of a long aluminum pipe near the cliff edge which survived in place from 1955 to 1965, it appears that motion has slowed to one-half the 1955-56 speed. Botanical studies indicate that principal changes reflect more snow drifts near the ice cliff and deeper flooding in Red Rock Lake which implies more snow and no drainage. Several hypotheses and deductions for ice cliff growth and decay are presented. (Woodard-USGS) W72-07972

GREAT LAKES ICE ATLAS, Lake Survey Center, Detroit, Mich.

D. R. Rondy. Available from the National Technical Informa-tion Service as COM-71-01052, \$3.00 in paper copy, \$0.95 in microfiche. Technical Memorandum NOS LSCR 1, September 1971. 48 p, 6 fig, 35 plate, 1 tab, 16 ref.

Descriptors: *Iced lakes, *Great Lakes, *Maps, *Ice cover, *Climatic data, Water temperature, Ice-water interfaces, Boundaries (Surfaces), Data Identifiers: Freezing degree days, Atlas.

Thirty-six charts illustrate the ice cover on the Great Lakes for three classifications of winter: mild, normal, and severe. Six ice charts are presented for each of the Great Lakes. Two charts show the maximum extent of ice cover during a mild and a severe winter and four charts illustrate the characteristic patterns and extent of the ice cover throughout a winter classified as normal. The percent of lake surface area that can be exnne percent of lake surface area that can be expected to become ice covered during a normal winter is: 60%, Superior; 40%, Michigan; 60%, Huron; 95%, Erie; and 15%, Ontario. Mid-winter ice thicknesses may range from 36 in. (91 cm) along the north shore of Lake Superior to 4 in. (10 cm) during a mild winter on the lower lakes. (Woodard-USGS)

NUMERICAL FORECAST AND ANALYSIS OF HYDROMETEOROLOGICAL FIELDS IN THE ARCTIC (CHISLENNYY PROGNOZ I ANALIZ GIDROMETEOROLOGICHESKIKH POLEY V ARKTIKE).

Antarkticheskii Arkticheskii Nauchno-Iss-Hatchies Hatchies Hatchies Hatchies Hatchies Hatchies Hedovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02B.
W72-08079

VOLUME OF SNOWMELT INTERCEPTED BY LOGGING ROADS.

Bureau of Land Management, Portland, Oreg. For primary bibliographic entry see Field 04C. W72-08088

ADDITIVES FOR MODIFYING THE FROST SUSCEPTIBILITY OF SOILS, PART II, Cold Regions Research and Engineering Lab., Hanover, N.H.
T. W. Lambe, C. W. Kaplar, and T. J. Lambie.
Technical Report 123, Pt 2, October 1971. 41 p, 7 fig. 17 tab, 10 ref, append. Contract DA-19-016-ENG-4006, -4657, -6061.

Descriptors: *Frost action, *Soils, *Soil moisture, *Frost heaving, Analytical techniques, Soil aggregation, Soil tests, Soil chemistry, Water proofing, Dispersion, Soil water movement, Frost, Thawing, Frost precipitation. Identifiers: *Ferric chloride, *Tetrasodium pyrophosphate, Research project.

A search was made for additives to reduce the frost susceptibility of soil. The additives are divided into four primary function groups: (1) void fillers and cementing agents, (2) aggregants, (3) waterproofers, and (4) dispersants. A dispersant, tetrasodium pyrophosphate (TSPP), and an aggregant, ferric chloride, possess good frost-heave-modifying capabilities. TSPP can reduce heave significantly under natural conditions. Laboratory tests were conducted to determine the effect of prolonged water attack on the frost-heave-modify-ing capabilities of 0.3% treatments of TSSP and ferric chloride when used with two silty sandy gravels. In terms of percentage reduction of heave the effectiveness of TSPP was not mitigated by water attack while the effectiveness of ferric chloride was slightly lessened. Both additives reduced the frost susceptibility of the soils from classification of 'medium to high' to 'very low to low.' Theory and experimental data are presented which help to explain the response of the soils to treatment and freezing. (Woodard-USGS) W72-08093

PROCEDURES FOR REMOVING SURFACE CONTAMINANTS FROM DEEP ICE CORES, Cold Regions Research and Engineering Lab., Hanover, N.H. S. E. Ragone, and R. Finelli

Special Report 167, March 1972. 7 p, 5 fig, 2 tab, 7 ref. NSF Grants AG 104 and AG 212.

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Descriptors: *Glaciology, *Core drilling, *Drilling fluids, *Wastes, *Cleaning, Pollutants, Methodology, Water chemistry, Precipitation (Atmospheric), Melt water. Identifiers: Ice cores, Surface contaminants, Contamination removal, Ultrasonic cleaning.

Deep ice cores recovered from the Greenland and

Antarctic ice caps represent a record of the environmental conditions that have existed in these areas over the past 100,000 years. These cores are areas over the past footowy years. Insections are valuable for studying ancient precipitation chemistry and its variations during climatic change. The ice core was subject to contamination from several different fluids during drilling: the meltwater formed by the thermal drill used over the first 535 formed by the thermal drill used over the first 535 m, ethylene glycol used to dissolve ice chips formed by the electromechanical drill used below this depth, and the fluid (88% diesel fuel/12% trichlorethylene) used to give the borehole hydrostatic stability to prevent its closure. Before any extensive chemical investigations could begin it was necessary to establish the types of contamination on the ice cores and methods for removing it. The objective of this study was to determine the effectiveness of several different cleaning methods. Ultrasonic vibration followed by self-cleaning in meltwater was found the most effective procedure for removal of surface contaminative procedure for removal of surface contamina-tion. (Woodard-USGS)

HYDROLOGY OF THE GLENN CREEK WATERSHED, TANANA RIVER BASIN, CEN-TRAL ALASKA, Cold Regions Research and Engineering Lab.,

Hanover, N.H. For primary bibliographic entry see Field 02A. W72-08095

HYDROLOGICAL OBSERVATIONS ON A SMALL ARCTIC CATCHMENT, DEVON McMaster Univ., Hamilton (Ontario). Dept. of

Geography.
S. B. McCann, and J. G. Cogley.
Canadian Journal of Earth Sciences, Vol 9, No 4, p 361-365, April 1972. 3 fig, 14 ref.

Descriptors: *Streamflow, *Regime, *Arctic, *Rainfall-runoff relationships, *Permafrost, Snowmelt, Floods, Surface waters, Snowpacks, Hydrographs, Cold regions. Identifiers: Devon Island (Canada).

Data and observations of the hydrological properties of a small arctic drainage basin were collected in the southwest of Devon Island, Canada. The basin is 2.3 sq km in area and is drained by a short stream known as Jason's Creek. The annual stream known as Jason's Creek. The annual hydrological regime of Jason's Creek begins in June or early July with a 10-15 day period of flooding as a result of snowmelt, preceded by a few days of relatively low flow. In 1970, 82% of the annual snowmelt discharge left the basin between June 26 and July 15. After the flood, discharge decreases irregularly but in a roughly asymptotic fashion until the stream freezes to its bed in late August or early September. This regime is punctu-August or early September. This regime is punctu-ated by occasional rainstorm floods. The flow of the stream varies diurnally in response to radiative thermal imputs of energy to the basin snow pack, the lag time for these inputs being 5h. The response of the basin to an input of rainfall is rapid and the duration of direct storm runoff is short. Sparseness of vegetation and shallowness of the active layer above the permafrost are important properties of the drainage basin. (Knapp-USGS) W72-08187

WATER SUPPLY AUGMENTATION BY WATERSHED MANAGEMENT IN WILDLAND

Pennsylvania State Univ., University Park. School

For primary bibliographic entry see Field 03B. W72-08384

CALCULATION AND FORECAST OF ICE PHENOMENA ON RIVERS AND RESERVOIRS (RASCHETY I PROGNOZY LEDOVYKHYAVLENIY NA REKAKH I VODOK-HRANILISHCHAKH). Gidrometeorologicheskii Nauchno-Issledovatellskii Tsentr, Leningrad (USSR).

Gidrometeorologicheskiy Nauchno-Issledovatel'-skiy Tsentr SSSR Trudy, No 67, 1970. 124 p.

Descriptors: *Ice, *Forecasting, *Meteorology, *Rivers, *Reservoirs, Snow cover, Ice cover, Ice breakup, Ice-water interfaces, Temperature, Atmospheric pressure, Anticyclones, Air circulation, Air masses, Thermal conductivity, Heat transfer, Statistical methods, Correlation analysis, Regression analysis, Synoptic analysis. Identifiers: *USSR, *Siberia, *Drift ice, *Snow ice, *Ice crystals, Anomalies.

This collection of 5 papers is devoted to a study of the natural occurrence and movement of ice on a number of rivers in the USSR. Titles of papers are: (1) study of the relationship of drift-ice formation on some rivers of the USSR to atmospheric circulation processes in the northern hemisphere; (2) long-range forecast of ice breakup on the Ob River below Kolpashevo and on the Irtysh River below Pavlodar; (3) calculating growth of ice crystals and snow ice on the Klyaz'ma Reservoir; (4) procedures for long-range forecast of drift-ice for-mation on the Lower Yenisey and Angara Rivers; and (5) thermal conductivity of water covered by ice. The collection is of particular interest to river forecasters, electrical engineers, navigation technicians, and students of universities and hydrometeorological institutes. (Josefson-USGS) W72-08425

STUDY OF THE RELATIONSHIP OF DRIFT-STUDY OF THE RELATIONSHIP OF DRIFT I-CE FORMATION ON SOME RIVERS OF THE USSR TO ATMOSPHERIC CIRCULATION PROCESSES IN THE NORTHERN HEMISPHERE (OPYT ISSLEDOVANIYA SVYAZI POYAVLENIYA PLAVUCHEGO L'DA NA NEKOTORYKH REKAKH SSSR S OSOBEN NOSTYAMI TSIRKULYATSII ATMOSFERY SEVERNOGO POLUSHARIYA), Gidrometeorologicheskii Nauchno-Issledovatel-skii Tsentr, Leningrad, USSR. Ye. I. Savchenkova.

In: Raschety i prognozy ledovykh yavleniy na rekakh i vodokhranilishchakh; Gidrometeorologicheskiy Nauchno-Issledovatel'-skiy Tsentr SSSR Trudy, No 67, p 3-36, Lenin-grad, 1970. 3 fig, 9 tab, 9 ref.

Descriptors: *Ice, *Rivers, *River basins, *Meteorology, *Air circulation, Air masses, Air temperature, Atmospheric pressure, Anticyclones, Geographical regions, Atlantic Ocean, Forecasting, Statistical methods, Correlation analysis, Synoptic analysis. Identifiers: *USSR, *Drift ice, Anomalies.

Dates of drift-ice formation on 8 large rivers of the USSR were based on observations of ice phenomena on the rivers for a 58-year period (1910-67). The rivers examined were the Dnieper, Don, Severnaya Dvina, Pechora, Ob, Yenisey, Lena, and Amur. Similar air temperature and pressure anomaly fields in different regions of the northern hemisphere for the 58-year period were determined in the month prior to river-ice formation. Changes in temperature and pressure anoma-lies for September and October were analyzed statistically for the northern hemisphere and its different sectors. Correlation of the dates of ice formation on rivers with changes in pressure anomalies can be used to develop procedures for long-range forecast of periods of ice occurrence. (Josefson-USGS) W72-08426

LONG-RANGE FORECAST OF ICE BREAKUP ON THE OB RIVER BELOW KOLPASHEVO AND ON THE IRTYSH RIVER BELOW PAVLODAR (METOD DOLGOSROCHNOGO PROGNOZA VSKRYTIVA R. OBI NIZHE S. KOLPASHEVO I R. IRTYSHA NIZHE G. PAVLODARA),

Gidrometeorologicheskii Nauchno-Issledovatel-skii Tsentr, Leningrad (USSR). N. D. Yefremova.

N. D. Terremova. In: Raschety i prognozy ledovykh yavleniy na re-kakh i vodokhranilishchakh; Gidrometeorologicheskiy Nauchno-Issledovatel'-skiy Tsentr SSSR Trudy, No 67, p 37-49, Lenin-grad, 1970. 2 fig, 10 tab, 6 ref.

Descriptors: *Ice, *Ice breakup, *Rivers, *Meteorology, Air masses, Air temperature, Air circulation, Cyclones, Anticyclones, Forecasting, Statistical methods, Correlation analysis, Regression analysis, Synoptic analysis.
Identifiers: *USSR, *Ob River, *Irtysh River.

Procedures developed for long-range forecast of ice breakup on lower reaches of the Ob and Irtysh Rivers were based on expansion of meteorological series using Chebyshev polynomials. The coefficients obtained from the expansion were used as an argument in computing regression equations. Correlation coefficients of the predicted values derived vary between 0.66 and 0.79. These values are of sufficient accuracy for use in operational forecasts. Ice breakup time for these rivers can be predicted, on the average, 20-44 days in a advance. (Josefson-USGS) W72-08427

CALCULATING GROWTH OF ICE CRYSTALS AND SNOW ICE ON THE KLYAZ'MA RESER-VOIR (RASCHET NARASTANIYA KRISTAL-LICHESKOGO I SNEZHNOGO L'DA NA PRIMERE KLYAZ'MINSKOGO VODOK-

HRANILISHCHA),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
V. V. Piotrovich.

V. V. Piotrovich.
In: Raschety i prognozy ledovykh yavleniy na rekakh vodokhranilishchakh;
Gidrometeorologicheskiy Nauchno-Issledovatel'skiy Tsentr SSSR Trudy, No 67, p 30-98, Leningrad, 1970. 9 fig, 7 tab, 13 ref.

Descriptors: *Ice, *Ice cover, *Ice-water interfaces, *Snow cover, *Reservoirs, Meteorology, Air temperature, Clouds, Wind velocity, Precipitation (Atmospheric), Water temperature, Freeinta-tion (Atmospheric), Water temperature, Freeinta-g, Melting, Thermal conductivity, Heat flow, Winter. Identifiers, "USSR, "Klyaz'ma Reservoir, "Ice crystals, "Snow ice.

Investigations were conducted during 4 consecutive winters (1956-59) to study accretion and melting of ice on the Pirogovskiy pool of the Klyaz'ma Reservoir (Moscow Canal) in west-central Soviet Russia. Average width of the pool is about 0.8 km and its depth about 9 m. Formulas are given for calculating daily growth of ice crystals in air temperatures ranging from 0 to minus 40 deg and for calculating heat flow from water to the undersurface of ice. Formation of snow ice on the reservoir is examined for calculating its thickness. (Josefson-USGS) W72-08428

PROCEDURES FOR LONG-RANGE FORECAST
OF DRIFT-ICE FORMATION ON THE LOWER
YENISEY AND ANGARA RIVERS (METODIKA
DOLGOSROCHNOGO
PROGNOZA
POYAVLENIYA PLAVUCHEGO L'DA NA
NIZHNEM YENISEYE I R. ANGARE),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
N. F. Vinoeradova.

Skii I sentr, Lennigaa (v. 558).
N. F. Vinogradova.
In: Raschety i prognozy ledovykh yavleniy na re-kakh i vodokhraniishchakh; Gidrometeorologicheskiy Nauchno-Issledovatel'-skiy Tsentr SSSR Trudy, No 67, p 99-108, Lenin-grad, 1970. 2 fig, 4 tab, 4 ref.

Group 2C—Snow, Ice, and Frost

Descriptors: *Ice, *Rivers, *Forecasting, *Meteorology, Anticyclones, Air masses, Air circulation, Air temperature, Atmospheric pressure, Weather patterns. (Weather patterns. "USSR, "Siberia, "Yenisey River, "Angara River, "Drift ice, Anomalies.

Development of procedures for long-range forecast of drift-ice formation on the Lower Yenisey and Angara Rivers was based on studies of the influence of the Siberian anticyclone on ice formation on the Yenisey in the fall. The Siberian anticyclone, which begins to develop in September, governs atmospheric circulation processes and weather patterns over the Asiatic part of the USSR during the cold season. Drift ice on the Lower Yenisey is usually formed in the period between October 15-25. Duration of drift ice on the Yenisey ranges from 3-9 days in lower reaches to 27-34 days in upper reaches and in reaches below the confluence of the Angara and Podkamennaya Tunguska Rivers. Drift ice on the rivers may form as early as the end of September or as late as the latter part of November. (Josefson-USGS) W72-08429

2D. Evaporation and Transpiration

SIMULTANEOUS FLOW OF WATER AND HEAT IN WATER UNSATURATED IOWA SOILS DURING EVAPORATION, Iowa State Water Resources Research Inst. For primary bibliographic entry see Field 02G. W72-08098

THE R INDEX FOR PLANT WATER REQUIRE-

Environmental Data Service, Silver Spring, Md. A. Y. M. Yao.

Agricultural Meteorology, Vol. 6, p 259-273, 1969. 12 fig. 2 tab. 7 ref.

Descriptors: *Evapotranspiration, *Model studies, Land use, Soil-water-plant relationships, Distribution, *Irrigation efficiency. Identifiers: *R index, Beta distribution, Kolmogorov-Smirnov method.

The frequency distribution model of the monthly and the bi-weekly R index, the ratio of actual evapotranspiration to potential evapotranspira-tion, is discussed and compared with the Beta distribution. The goodness of fit of the Beta distributribution. The goodness of it of the Beta distribution to the R index frequency distribution was tested using the Kolmogorov-Smirnov method for 173 station-month and bi-weekly curves. For values of R>0.95, the Kolmogorov-Smirnov test specified no rejection, at the 15% level, of the hypothesis that the R index follows a Beta distribution. With R>0.95, 36 of the 173 R index curves failed the K-S tests. However, R<0.95 has only very limited value for most agricultural plants. The probability distribution of R can, therefore, be used as a tool to help solve the problems of agricultural land use capability, long term agricultural planning, irrigation project design, and agricultural drought. (Skogerboe-Colorado State) W72-08116

2E. Streamflow and Runoff

APPLICATION OF DIGITAL COMPUTERS TO HYDRAULIC COMPUTATION OF THE RELA-TIONSHIP BETWEEN WATER LEVELS AND DISCHARGES DISCHARGES IN RIVER DELTAS (GIDRAVLICHESKIY RASCHET SVYAZEY (GIDRA VLICHESBITY KASCHET SYTAZI MEZHDU RASKHODAMI I UROVNYAMI DEL'TAKH REK NA ETSVM), Arkticheskii i Antarkticheskii Nauchno-Is ledovatelskii Institut, Leningrad (USSR), V. V. Ivanov, and E. S. Mednikova. Nauchno-Iss-

In: Chislennyy prognoz i analiz gidrometeorologicheskikh poley v Arktike; Ark-

ticheskiy i Antarkticheskiy Nauchno-Iss-ledovatel'skiy Institut Trudy, No 291, p 44-57, Leningrad, 1970. 3 fig, 3 tab, 13 ref.

Descriptors: *Systems analysis, *Digital computers, *Stage-discharge relations, *Deltas, *Rivers, Channels, Water levels, Discharge (Water), ters, "Stage-discharge tensors," Channels, Water levels, Discharge (Water), Backwater, Computer programs, Approximation method, Least squares method.

Identifiers: "USSR, "Flow diagramming, Flow the Hydrometric stations." diagrams, Flow charts, Hydrometric stations.

program was devised for computing the relationship between water levels and water discharges in arms of river deltas located in the zone of variable backwater. A flow diagram of the operations involved in the program is shown in connection with preparation and coding of the initial data for computation of the relationship on a digital computer. Computations can be performed in several minutes on a 'Ural-2' digital computer. The method can also be used to compute flow in river channels subject to variable backwater. (Josefson-USGS) W72-08080

PREDICTING SURFACE RUNOFF FROM AGRICULTURAL WATERSHEDS, Iowa State Univ., Ames. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 02A.

WATER RESOURCES INVESTIGATIONS IN ARKANSAS, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-08090

WATER RESOURCES INVESTIGATIONS IN FLORIDA, 1969. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-08091

UPPER BEAR CREEK EXPERIMENTAL PRO-JECT: A CONTINUOUS DAILY-STREAMFLOW

Tennessee Valley Authority, Knoxville. Div. of Water Control Planning.
For primary bibliographic entry see Field 02A. W72-08097

FREE-VORTEX THEORY APPLIED TO FREE OVERFALLS, Liverpool Univ. (England). Dept. of Civil En-

gineering. For primary bibliographic entry see Field 08B. W72-08193

REATTACHING FLOW DOWNSTREAM OF LEAF GATE, University of Manchester Inst. of Science and

Technology (England).
For primary bibliographic entry see Field 08B.

DRAG COEFFICIENT OF CYLINDERS IN TUR-BULENT FLOW, Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.

For primary bibliographic entry see Field 08B. W72-08196

FLOW PROCESSES IN OPEN CHANNEL BENDS State Univ. of New York, Buffalo. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B.

A STUDY OF THE TURBULENCE CHARAC-TERISTICS OF DIVERGING SHEAR FLOW, California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 08B.
W72-08220

RESERVOIRS WITH MIXED MARKOVIAN-I-NDEPENDENT INFLOWS, Lancaster Univ., Bailrigg (England). Dept. of Mathematics. For primary bibliographic entry see Field 04A. W72-08250

RUNHYDROGRAPHS-A NEW CONCEPT ON HYDROGRAPH GENERATION, Natal Univ., Durban (South Africa). Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-08270

SOME APPLICATIONS OF STOCHASTIC HYDROLOGICAL MODELS, Imperial Coll. of Science and Technology, London (England). Dept. of Engineering Hydrology. For primary bibliographic entry see Field 06A. W72-08272

FLOOD OF JANUARY 1969 NEAR VENTURA, CALIFORNIA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-08406

WATER RESOURCES INVESTIGATIONS IN KENTUCKY, 1972.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C. W72-08410

WATER RESOURCES INVESTIGATIONS IN MASSACHUSETTS, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

HIERARCHICAL SYSTEMS: CITIES, RIVERS, ALPINE GLACIERS, BOVINE LIVERS, AND TREES. Univ., Cambridge, Mass. Graduate School of Design.
For primary bibliographic entry see Field 04A.
W72-08434

2F. Groundwater

WATER WELLS AND SPRINGS IN IVANPAH VALLEY, SAN BERNARDINO COUNTY, VALLEY, SA CALIFORNIA,

Geological Survey, Menlo Park, Calif. W. R. Moyle, Jr.

W. R. Moyle, Jr.
Available from State of Calif, Documents Sections, P O Box 20191, Sacramento, Calif 95820
Price \$2.00. California Department of Water
Resources Bulletin No 91-21, January 1972. 56 p, 14 map, 5 tab, 17 ref.

Descriptors: *Groundwater, *Basic data collections, "Deserts, "California, "Water wells, Springs, Logging (Recording), Water levels, Drawdown, Specific capacity, Aquifers, Water quality, Water analysis, Chemical analysis, Water properties, Water utilization. Identifiers: *Ivanpah Valley (Calif), *San Bernar-dino County (Calif).

Groundwater data on 190 wells and springs in southern California's Ivanpah Valley desert area are presented. Location of water wells and springs; well depth and yield, water use and level on dates observed; names of the well owners;

pumping data, including depths, rates, static water level, drawdowns, and specific capacities; lithologic data from drillers' well logs; and water quality are included. (Woodard-USGS) W72-07954

GROUNDWATER FLOW SYSTEM ANALYSIS IN LAKE ENVIRONMENTS, WITH MANAGE-MENT AND PLANNING IMPLICATIONS, Wisconsin Univ., Madison. Water Resources Management Program. D. A. Stephenson.

Water Resources Bulletin, Vol 7, No 5, p 1038-

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Descriptors: *Groundwater, *Flow characteristics, *Systems analysis, *Lakes, Seepage, Management, Planning, Recreation, Hydrogeology, Physical properties, Lake shores, Eutrophication, Water quality, Urbanization, Surface gy, rhysical properties, Lake shores, Europhication, Water quality, Urbanization, Surfacegroundwater relationships, Anisotrophy, Drainage, Seepage, Wisconsin, Impoundments, Nutrients, Regulation Remedies, Bogs. Identifiers: Drainage lakes, Seepage lakes.

The number of natural lakes that are available and amenable to development for recreation and home sites has diminished to the point that there is now an impetus toward creation of man-made lakes. Evaluation of lakes as they are related to groundwater flow systems is of special concern prior to efficient development and planning operations. Field verification of theoretical groundwater flow system behavior has progressed to the point where hydrogeologists, trained to understand basic con-cepts of flow-system analysis, can begin to broaden their research and service base, and to work closer with planners, developers, and en-gineers. Particular efforts should be directed toward a greater evaluation of physical, chemical, and biological aspects of potentially developable lake sites to aid in selecting use patterns in accord with these factors. Many lake developments are not in harmony with the physical environment. The resulting misuse of resources is often expressed as accelerated eutrophication of lakes, or pressed as accelerated eutropinication of lakes, or by quality degradation of shallow groundwater flow systems contiguous to them. Lakes can no longer be considered as separate entites Methodology for investigating inter-change of surface and near-surface water is adequate; the application of known interchange relationships in in-adequate. (Jones-Wisconsin) W72-08053

BASIN RECHARGE OF THE OGALLALA AQUIFER, Southwestern Great Plains Research Center,

Bushland, Tex.
For primary bibliographic entry see Field 04B.
W72-08085

CLAYS WITH ABNORMAL INTERSTITIAL FLUID PRESSURES, Queensland Univ., Brisbane (Australia). Dept. of

Geology and Mineralogy. R. E. Chapman.

American Association of Petroleum Geologists Bulletin, Vol 56, No 4, p 790-795, April 1972, 3 fig,

Descriptors: *Groundwater movement, Aquicludes, *Oil fields, *Water pressure, *Hydraulic conductivity, Clays, Hydrostatic pressure, Hydraulic gradient, Pressure head, Stress, Strain, Compaction, Diagenesis.
Identifiers: Abnormal pore pressure.

Abnormally pressured clay sequences generally have been abnormally pressured since burial to a shallow depth (2,000 ft or even less) in areas of loading under sediments. Zones of abnormal fluid pressure are caused more by low hydraulic conductivity in a rock unit or sequence than by load or rate of loading. Hence the transition zone from normal to abnormal pressures at the top of a relatively impermeable sequence will have its mirror image at the bottom of the unit, if it overlies a ence of sufficient hydraulic conductivity. The potential below an abnormally pressured clay sequence is similar to that above it. (Knapp-USGS) W72-08089

WATER RESOURCES INVESTIGATIONS IN ARKANSAS, 1968. Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

WATER RESOURCES INVESTIGATIONS IN

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

GROUND-WATER RESOURCES, CUMBER-LAND COUNTY, NEW JERSEY, Geological Survey, Trenton, N.J.

New Jersey Department of Environmental Protection, Division of Water Resources Special Report No 34, 1971. 103 p, 13 fig, 16 tab, 21 ref, append.

Descriptors: *Groundwater, *Hydrologic budget, *Aquifers, *Water supply, *New Jersey, Water wells, Water yield, Withdrawal, Water users, Groundwater recharge, Water quality, Stream-flow, Precipitation (Atmospheric), Sediment, Chemical analysis, Hydrologic data, Basic data collections

Identifiers: *Cumberland County (N.J.).

An average annual hydrologic budget was computed for Cumberland County, New Jersey. Water gains are: precipitation, 1,050 mgd (million gallons per day); surface-water inflow, 142 mgd; groundwater inflow, negligible. Water losses are: evapotranspiration, 685 mgd; surface-water outflow, 370 mgd; groundwater outflow, 137 mgd; groundwater Two principal aquifers are in the Kirkwood Formation and Cohansey Sand: (1) the lower Kirkwood aquifer and (2) the Cohansey-Kirkwood aquifer and (2) the Cohansey-Kirkwood aquifer Most wells tapping the lower Kirkwood aquifer yield less than 50 gpm but are capable of yielding as much as 400 gpm. The Cohansey-Kirkwood aquifer generally yields large supplies of water (300 to 1,200 gpm) to wells from depths of less than 180 feet. Water in the Cohansey-Kirkless than 180 feet. Water in the Cohansey-Kirk-wood aquifer is characterized by low dissolved-solids content (63 mg/l, median), low hardness (21 mg/l, median), and low pH values (5.5 pH units, median). In 1964 withdrawals in Cumberland County averaged about 51 mgd; almost all of this, 49.4 mgd, was from groundwater supplies. Water use in 1964 was: public supply, 10.6 mgd; industri-al uses, 19.0 mgd; irrigation, 15.4 mgd; suburban, rural, residential, institutional, farm, and commer-cial, 5.9 mgd. (Woodard-USGS) cial, 5.9 mgd. (Woodard-USGS) W72-08096

MAPPING GROUND WATER BY USING ELEC-TRICAL RESISTIVITY WITH A BURIED CURRENT SOURCE,

ennsylvania State Univ., University Park. Dept. of Geosciences

Br. H. Merkel, and J. T. Kaminski. Ground Water, Vol 10, No 2, p 18-25, March-April 1972. 11 fig, 5 tab, 11 ref.

Descriptors: *Electrical well logging, *Ground-Descriptors: "Electrical well logging, "Ground-water movement, "Hydrogeology, "Aquifer characteristics, "Borehole geophysics, Structural geology, Stratigraphy, Dolomite, Limestones, Fractures (Geologic), Fracture permeability. Identifiers: Centre County (Penn).

Standard resistivity configurations lose resolution in regions with multiple geologic layering of high conductivity contrast. To partially circumvent this problem and electrode configuration was used

which includes a current electrode deep in the drill hole to delineate groundwater flow channels. This technique is useful in enhancing the electrical anomaly and hence determining geological struc-ture. Groundwater in the area examined flows primarily in fracture traces in dolomite. These fractures traces increase the effective porosity in the flow region by approximately 10%. (Knapp-USGS) W72-08184

PRACTICAL CORROSION AND INCRUSTA-TION GUIDE LINES FOR WATER WELLS, Universal Oil Products Co., St. Paul, Minn. John-For primary bibliographic entry see Field 04B.

RETENTION OF BORON BY TRAVERTINES, Tokyo Metropolitan Univ., (Japan). Faculty of Science. For primary bibliographic entry see Field 02K. W72-08188

SEEPAGE FROM SHALLOW OPEN CHANNEL, Washington Univ., Seattle. Dept. of Civil Engineering. For primary bibliographic entry see Field 04A. W72-08204

ON THE CALCULATION OF HYDRAULIC CONDUCTIVITY, Agriculture Research Service, Phoenix, Ariz. For primary bibliographic entry see Field 02G. W72-08205

STEADY INFILTRATION FROM BURIED, SUR-FACE, AND PERCHED POINT AND LINE SOURCES IN HETEROGENEOUS SOILS: 1. ANALYSIS.

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics. For primary bibliographic entry see Field 02G.

GEOHYDROLOGY OF THE EASTERN PART OF PAHUTE MESA, NEVADA TEST SITE, NYE COUNTY, NEVADA, Geological Survey, Denver, Colo. Ge. K. Blankennagel, and J. E. Weir, Jr. Geological Survey Open-file Report, January 1972. 117 p, 16 fig, 12 tab, 27 ref.

Descriptors: "Hydrogeology, "Groundwater movement, "Aquifer characteristics, "Nevada, Observation wells, Water yield, Water quality, Transmissivity, Hydrologic data, Data collections, *Groundwater Drill holes.
Identifiers: *Nuclear test site (Nev). Volcanic

rock strata.

A deep structural depression, the Silent Canyon caldera, underlies the eastern part of Pahute Mesa, Nye County, Nevada. The caldera is elliptical in plan and measures about 11 by 14 miles. Most movement of groundwater beneath the mesa oc-curs through interconnecting fault and joint systems. Fractures are more common in rhyolitic lava flows and in densely welded ash-flow tuffs. Depth to water ranges from about 1,952 feet in the western part to 2,350 feet in the eastern part. In the extreme northwestern part of the Nevada Test Site, outside the caldera, the depth to water is about 850 feet. Head potentials are stable or decline with depth in all but one of the holes drilled in the eastern part. In the western part of the area, head potentials are variable in the upper 1,500 feet of the saturated zone, and then increase with depth. Transmissivities range from 1,400 to more than 100,000 gallons per day per foot. The greatest transmissivities occur in holes drilled along the

Group 2F-Groundwater

eastern margin of the caldera where the principal vasiciii margin of the caldera where the principal rock type in the saturated zone is rhyolite. Water derived from drill holes at Pahute Mesa is sodium potassium type. (Woodard-USGS) W72-08407

WATER RESOURCES INVESTIGATIONS IN KENTUCKY, 1972. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-08410

WATER RESOURCES INVESTIGATIONS IN MASSACHUSETTS, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

WATER WELL AND GROUND-WATER CHEMICAL ANALYSIS DATA, GLASSCOCK COUNTY, TEXAS, Texas Water Development Board, Austin For primary bibliographic entry see Field 04B.

2G. Water in Soils

A SIMPLE AUTOMATIC WATERER FOR GROWTH ROOM OR GREENHOUSE, Department of Agriculture, Summerland (British Columbia). Research Station. D. S. Stevenson, and D. M. Munn. Canadian Journal of Soil Science 50 (3): 461-462.

Descriptors: *Transpiration.
Identifiers: *Automatic waterer, Greenhouse,
Growth, *Soil water suction, *Sunflower-D.

For study of plant growth at very low soil water suctions and if transpiration is equal to or only slightly greater than the rate at which water will move to absorbing roots, it is possible to keep soil water suction within reasonable limits. An automatic continuous-watering mechanism, utilizing a solution balance, for potted plants is described. The device waters plants continuously and accurately. It has operated with practically no attention from emergence to harvest time of sunflower (45-50 days). It eliminates the weekend watering chore. Where control of soil water suction is not critical, this device could be made to water a large group of pots in the greenhouse by arranging 1 pot to act as sensor for the others.—Copyright 1972, Biological Abstracts, Inc.

COASTAL AND MOUNTAIN SLOPE INSTA-BILITY ON THE ISLANDS OF ST. LUCIA AND BARBADOS,

Queen's Univ., Belfast (Northern Ireland). Dept.

of Geography.
D. B. Prior, and C. Ho.
Engineering Geology, Vol 6, No 1, p 1-18, March
1972. 9 fig, 3 tab, 14 ref.

Descriptors: *Slope stability, *Landslides, *Clays Plasticity, Atterberg limits, Leaching, Clay minerals, Ion exchange, Montmorillonite, Kaolinite, Illite. Identifiers: Chlorite, Barbados (BWI), St. Lucia

Rotational, translational, complex slides and slump-earthflows are present on the islands of St. Lucia and Barbados. Complex slides involving pure montmorillonite clays occur on coastal sites. Mixtures of kaolinite, montmorillonite, illite, and chlorite clay minerals are involved in rotational slides and slump-earthflows, while pure kaolinite soils are associated with translational slides. All the soils show variations in Atterberg limits related to the nature of the clay minerals, the amounts of clay, and the adsorbed ions. Sodium ions enchance the plasticity of montmorillonite clay and these ions are most abundant on coastal sites. Kaolinite soils in inland areas are generally less plastic ex-cept where extreme leaching has produced horizons rich in clay, calcium, and magnesium. (Knapp-USGS) W72-07955

RHEOLOGICAL EQUATION OF A SILT, DETERMINED WITH THE AID OF A NEWLY DEVELOPED TEST APPARATUS, Institute for Soil Mechanics and Foundation En-

gineering, Kassel (West Germany). D. Fedder. Engineering Geology, Vol 6, No 1, p 43-48, March 1972. 3 fig, 9 ref.

Descriptors: *Rheology, *Silts, *Instrumentation, *Soil physical properties, Plasticity, Viscosity, Equations, Model studies, Laboratory tests, Strain, Stress, Strength of materials, Elasticity (Mechanical), Pore water.

Flat prismatic soil samples were subjected to reep and recovery experiments in newly eveloped shear cells. The deformation took place below failure in simple shear, that is, in plane strain. The pore-water pressure in the sample was measured at the same time. All observed phenomena could be expressed in a rheological equation, in which the shear stress could be related to the shear strain, to the time, and to the soil parameters. The equation can be interpreted by a rheological model. The model parameters (elasticity, viscosity, plasticity) depend on the consistency of the tested materials. (Knapp-USGS)

STUDY OF FILTRATION RATES (ISS-LEDOVANIYE STABIL'NOSTI FIL'TRATSION-NOGO POTOKA VO VREMENI), Agrofizicheskii Nauchno-Issledovatelskii Institut,

Leningrad (USSR). N. F. Bondarenko, Ye. A. Shumilova, Yu. N. Saprykin, N. P. Kovalenko, and I. A. Kibereva Pochvovedeniye, No 7, p 70-76, July 1971. 4 fig, 2 tab. 22 ref.

Descriptors: *Soil physics, *Filtration, *Filters, Permeability, Adsorption, Porous media, Pores, Gases, Soils, Hydraulic properties, Rheology. Identifiers: *USSR, Filtrates.

Factors responsible for changes in filtration rates in soils and parent materials were examined under laboratory conditions. The substantial decrease in permeability of porous samples with time may be attributed to a change in the geometry of the wettable pore space produced by gases adsorbed from the filtering liquid. A method was developed for obtaining filtration coefficients which are stable in time and reproducible. (Josefson-USGS)

CHEMISTRY AND SALINITY OF SOILS IN THE IVOLGA RIVER VALLEY OF THE BURYAT ASSR (KHIMIZM I STEPEN' ZASOLENIYA POCHV DOLINY R. IVOLGI (BURYATSKAYA ASSR)),
Akademiya Nauk SSSR, Moscow. Pochvennyy Institut.

Institut.

T. V. Korolyuk. Pochvovedeniye, No 7, p 92-100, July 1971. 3 fig, 3

Descriptors: *Land reclamation, *Saline soils, *Soil chemistry, *Salinity, *Salts, Groundwater, Topography, Petrology, Climates, Soil profiles. Identifiers: *USSR, *Transbaikalia, Buryat ASSR, Ivolga River, Diluvium, Mineralization.

The distribution of saline soils in the Ivolga River valley of western Transbaikalia (Buryat ASSR) is examined. Concentration of salts in the soils is affected by basin topography, lithology, climatic

conditions, and by groundwater depth, chemistry, and mineralization. Salts in soil materials of the basin are predominantly bicarbonate and sulfate. Soils are divided into 3 groups on the basis of salt content: (1) weakly and moderately saline (0-4 kg of salts/sq m); (2) strongly saline (4-13 kb of salts/sq m); and (3) very strongly saline (>13 kg of salts/sq m). Very strongly saline soils dominate the right bank of the river valley where fine-textured rocks are widespread. Strongly saline soils are generally formed on coarse sandy and loamy sand deposits. Weakly and moderately saline soils are found on diluvial slopes and along the banks of the Ivolga River. Of the individual factors affecting salinization, groundwater chemistry and mineralization are the most important. (Josefson-USGS) W72-08074

DETERMINATION OF THE LOWER LIMIT OF SOIL WATER AVAILABLE TO FRUIT CROPS
(OPREDELENIYE NIZHNEGO PREDELA
POCHVENNOY VLAGI, DOSTUPNOY DLYA
PLODOVYKH RASTENIY),
Belorusskii Nauchno-Issledovatelskii Institut

Plodovodstva, Ovoshchevodstva i Kartofelya, Minsk (USSR). A. S. Devvatov.

Pochvovedeniye, No 7, p 76-82, July 1971. 1 fig, 6

Descriptors: *Soil physics, *Soil water, *Available Descriptors: "Soil physics, "Soil water, "Available water, "Wilting point, "Fruit crops, Plant growth, Soil moisture, Moisture availability, Absorption, Loam, Clays, Muck soils, Sands, Soil physical properties, Soil chemical properties, Particle size, Distribution patterns.

Identifiers: "USSR, Sunflower.

Pot tests were conducted in 1968-69 to study the wilting moisture of different soils, using sunflowers and fruit trees as indicators. Fruit trees are able to use 16%-24% more water than sunflowers use from loam, clay, and muck soils, and 40% more from sandy soil, before steady wilting. Fruit trees absorbed the relatively inaccessible water in different ways. Distribution patterns of the maximum differences between available water in soil planted to sunflowers and fruit trees analyzed quantitatively. (Josefson-USGS) W72-08075

INVESTIGATION OF THE FREE INFILTRA-TION OF WATER INTO SOIL DURING SPRIN-KLER IRRIGATION (ISSLEDOVANIYA BEZNAPORNOGO VPITYVANIYA VODY V POCHVU PRI POLIVE DOZHDEVANIYEM), Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). N. S. Yerkhov.

Pochvovedeniya, No 7, p 108-116, July 1971. 3 fig, 3 tab. 13 ref.

Descriptors: *Soil science, *Soil water, *Infiltra-tion, *Infiltration rates, *Sprinkler irrigation, Sprinkling, Rainfall intensity, Raindrops, Permea-bility, Pressure, Regression analysis, Probability. Identifiers: *USSR, Moldavia, Moscow Oblast, Kuybyshev Oblast, Film water.

Extensive field and laboratory tests were conducted in 1963-69 in the Moscow and Kuybyshev Oblasts and Moldavia to determine the effect of rainfall intensity and raindrop size on the free infiltration of water into soil during sprinkler irrigation. Infiltration of water into soil during sprinkling can be divided into 2 stages: (1) free (pressureless) infiltration when there is no continuous water film on the soil surface; and (2) infiltration under pressure after a uniform water layer appears on the surface. An index of free soil-water permeability during sprinkling was proposed as a specific soil characteristic. (Josefson-USGS) W72-08076 SOME RECLAMATION CHARACTERISTICS OF SOILS OF CENTRAL CUBA (NEKOTORYYE MELIORATIVNYYE OSOBENNOSTI POCHV TSENTRAL'NOY CHASTI KUBY), For primary bibliographic entry see Field 04B. W72-08077

CORRELATION BETWEEN CONSISTENCY AND MOISTURE CONTENT OF TAKYR-LIKE SOILS OF THE TURKMEN SSR (KORRELYAT-SIONNAYA SVYAZ' MEZHDU TVERDOST'YU I VLAZINOST'YU TAKYROVIDNYKH POCHV TURKMENII),

A. G. Yuzeyev, and Yu. K. Mogilevets. Pochvovedeniye, No 8, p 85-89, August 1971. 4 fig, 3 tab, 6 ref.

Descriptors: *Soil physics, *Soil physical properties, *Soil density, *Soil moisture, *Moisture content, Irrigation, Loam, Particle size, Soil density probes, Correlation analysis, Regression analysis. Identifiers: *USSR, *Turkmen SSR, *Soil consistency, *Takyrs, Skewness.

Tests were conducted in July-October 1968 on Takyr-like medium loam soils in the Tedzhen Rayon of the Turkmen SSR to study the relationship between soil consistency and moisture content. A close relationship was established between consistency and moisture content of the soils at a 0.1% significance level. This relationship is expressed by an empirical regression equation and holds for a moisture content ranging from 7% to 18%. Other properties remaining the same, soil consistency determines the pulling capacity of tractors and the rate of wear of soil-cutting blades. (Josefson-USGS)

EXPERIMENTAL IRRIGATION OF CISCAUCASIAN CHERNOZEMS WITH MINERALIZE
WATERS OF THE GULF OF TAGANROG
(OPYT OROSHENIYA PREDKAVKAZSKIKH
CHERNOZEMOV MINERALIZOVANNYMI
VODAMI TAGANROGSKOGO ZALIVA),
Yuzhnyi Institut po Proektirovaniyu Vodokhozyaistvennogo i Meliorativnogo Stroitelstva,
Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 03C.
W72-08081

ERODIBILITY OF SELECTED TROPICAL SOILS.

SOILS, Agricultural Research Service, Watkinsville, Ga. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 02J. W72-08083

AUGER-HOLE HYDRAULIC CONDUCTIVITY: FIRST VERSUS SECOND TEST, Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div. A. S. Dylla, and D. W. Michener. American Society of Agricultural Engineers Transactions, Vol 14, No 3, p 582-583, May-June 1971. 2 fig, 6 ref.

Descriptors: *Hydraulic conductivity, *Transmissivity, *Aquifer testing, *Boreholes, *Pumping, Water yield, Calibrations, Soil water movement, Water table, Drawdown, *Nevada. Identifiers: *Reno (Nev).

Hydraulic conductivity measurements were made from over 300 auger holes on a Truckee series soil at the University of Nevada Agricultural Experiment Station Main Farm at Reno. At least two tests were made from each auger hole. With paired hydraulic conductivity measurements (first and second) for each auger hole, the statistical Students t-test for the paired data was used to determine if there was any real difference between the means of the first and second measurements. There was no significant difference between the first and second hydraulic conductivity measure-

ments of an auger hole. Observed or apparent individual difference between measurements at a hole was the result of some random physical occurrence that caused a change in the hydraulic conductivity measured. About half the time, the first measurement was larger. This indicated that it should not be necessary to pump or bail the hole a few times before conductivity measurements to allow it to 'cleanse'. (Knapp-USGS)

**W77.0808.

SEEPAGE FROM TRENCHES THROUGH NON-HOMOGENEOUS SOILS, Egyptian Desert Institute, Cairo. Water Resources Div.

For primary bibliographic entry see Field 04A. W72-08087

CLAYS WITH ABNORMAL INTERSTITIAL FLUID PRESSURES, Queensland Univ., Brisbane (Australia). Dept. of Geology and Mineralogy. For primary bibliographic entry see Field 02F. W72-08089

ADDITIVES FOR MODIFYING THE FROST SUSCEPTIBILITY OF SOILS, PART II, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 02C. W72-08093

SIMULTANEOUS FLOW OF WATER AND HEAT IN WATER UNSATURATED IOWA SOILS DURING EVAPORATION, Iowa State Water Resources Research Inst. D. Kirkham, and N. L. Powell. Available from the National Technical Information Service as PB-208 986, \$3.00 in paper copy, \$0.95 in microfiche. Report ISWRRI-35, June 1971. 36 p, 10 ref., 2 append. OWRR A-026-IA (6).

Descriptors: *Soil water movement, *Unsaturated flow, *Evaporation, *Soil properties, *Soil water, Infiltration, Permeability, Diffusion, Analytical techniques, Theoretical analysis, Computer programs, Mathematical studies, Temperature, Flowrates, Heat transfer, Water transfer, Soil temperature.

Identifiers: Gamma-ray attenuation, Resolving time, Mass absorption coefficient, Isothermal diffusion, Soil shrinkage cracks.

Studies were made to determine how water moves in unsaturated soils under non-isothermal conditions produced during evaporation for three situations: (a) one- and two-dimensional flow in homogeneous soils; (b) two-dimensional flow in soils with simulated shrinkage cracks; and (c) one- and two-dimensional flow in layered soils. Differential equations describing simultaneous flow of heat and moisture are solved for the boundary conditions given. Experimental and theoretical results are compared to test the validity of the differential equations of Philip and deVries that describe simultaneous heat and moisture flow. The alternating-direction implicit method for solving transient two-dimensional water flow equations proved convergent and stable. The technique enables one to predict the soil water content if the soil water diffusivity, the hydraulic conductivity, and the initial and boundary conditions are known. The technique is flexible and can incorporate hysteresis, soil nonhomogeneity, changes in initial and boundary conditions, and geometric dimensions. (Woodard-USGS)

A SIMPLE, TENSION-FREE LYSIMETER, Puerto Rico Nuclear Center, Rio Piedras. C. F. Jordan. Soil Science, Vol 105, No 2, p 81-86, 1968. 5 fig, 4 Descriptors: *Lysimeters, Instrumentation, Soil water, Water loss, *Percolation, Potassium, Calcium, *Soil types, *Podzols, Soil horizons, New Jersey, Surface tension, *Sands, Measurement. Identifiers: *Lakewood sand, *Zero-tension lysimeter.

The 'Zero-Tension' lysimeter can be installed in almost any type of soil, and the problem of surface tension, common to many lysimeters, is eliminated. It was tested in Lakewood sand, a podsol soil in New Jersey. When light precipitation occurred, element concentration in the water collected from the A and C horizons was high, but the B horizon and the underlying glauconite bearing bed had soil water low in element content. During heavy storms, however, element concentration in water from the B and glaconite horizons was higher than from the A and C. Potassium and calcium moved into solution more rapidly than iron in the podsol A horizon, but iron moved out more rapidly in the B. A large difference in total quantity of elements moving into A horizon lysimeters occurred between two areas both mapped as Lakewood sand. The area with the greater element movement had a coarser texture, and the A horizon extended deeper. (Skogerboe-Colorado State)

CROP SEEDLING UPTAKE OF DDT, DIEL-DRIN, ENDRIN, AND HEPTACHLOR FROM SOILS,

Agricultural Research Service, Beltsville, Md. Crops Research Div. For primary bibliographic entry see Field 65B. W72-08114

STEADY-STATE POTENTIAL AND MOISTURE PROFILES IN LAYERED POROUS MEDIA, Agricultural Coll. of Athens (Greece). Dept. of Agricultural Chemistry.
A. Poulovassilis.
Soil Science, Vol. 107, No. 1, p 47-52, January, 1969, 12 fig, 10 ref.

Descriptors: *Soil moisture, *Porous media, *Moisture tension, *Potential flow, *Soil profiles. Identifiers: *Moisture profiles, *Layered soil.

The shape of the steady-state potential and moisture profiles in a layered porous column has been examined both theoretically and experimentally. The general shape of such a profile depends upon the layer sequence and the suction value prevailing at the junction which depends not only upon the magnitude of the flow rate but also for the first junction upon its position with respect to the water table and for the subsequent ones upon the width of the layers. (Skogerboe-Colorado State) W72-08122

RECOVERY OF DIFFERENTIALLY PLACED NO3-N IN A SILT LOAM SOIL BY FIVE CROPS,

Wisconsin Univ., Madison. Dept. of Horticulture; and Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 03F. W72-08123

PHOSPHORUS ADSORPTION SITES IN SOILS, Connecticut Agricultural Experiment Station, New Haven.

For primary bibliographic entry see Field 05G. W72-08126

A RAPID METHOD OF SOIL MOISTURE DETERMINATION, Punjab Agricultural Univ., Hissar (India). S. S. Prihar, and B. S. Sandhu. Soil Science, Vol. 105, No. 3, p 142-144, 1968. 1 fig. 1 tab, 4 ref.

Group 2G-Water in Soils

Descriptors: *Soil moisture, *Instrumentation, *Moisture content, Soil moisture meters, Soil water, Soil dentifiers: Flask, Oven-dry method.

A two-piece, 100-ml. glass flask has been devised for rapid determination of soil moisture. The principle involved is the variable increase in the known volume of liquid with the addition of a soil sample of varying moisture contents. The increase in volume is measured in the calibrated tubular stopper of the flask. Moisture contents of ten soils were determined simultaneously using oven-dry methods and the flask method. The soils ranged from fine sand to clay loam with pH from 5.3 to 8.5, organic carbon from 0.2 to 0.8 percent and moisture contents varying from 2.6 to 36.8 percent. Ninety percent of the values obtained with the flask are within plus or minus 1.0 ercent moisture difference from the oven=DRY Regression equations computed for four soils and collectively for all soils are almost identical. Therefore, the new method can be said to be equally applicable to the range of soils studied. (Skogerboe-Colorado State) W72-08130

EFFECT OF TIME AND METHOD OF NITROGEN APPLICATION AND SOURCE OF NITROGEN ON THE YIELD AND NITROGEN CONTENT OF CORN (ZEA MAYS L.), Ridgetown Coll. of Agricultural Tech. (Ontario). Soils Div. For primary bibliographic entry see Field 03F.

W72-08131

SOIL WATER POTENTIAL AND WATER CON-TENT PROFILES WITH WHEAT UNDER LOW SPRING AND SUMMER RAINFALL, Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 03F. W72-08137

SOIL SALINITY EFFECTS ON ABSORPTION OF NITROGEN, PHOSPHORUS, AND PROTEIN SYNTHESIS BY COASTAL BERMUDAGRASS, Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div. G. W. Langdale, and J. R. Thomas.

Agron J. 63 (5): 708-711.1971. Identifiers: Absorption, Bermuda, Coa Cynodon-Dactylon-M, Grass-M, Nitro Phosphorus, Protein, Salinity, Soil, Synthesis. Coastal. Nitrogen,

The interaction of artificially salinized soil and N-P fertilization on dry-matter production and protein synthesis of coastal bermudagrass (Cynodon dactylon (L.) Pers.) was studied in a greenhouse environment. Saline solutions were prepared in concentration multiples with the same ionic ratios as the available irrigation water to develop 4 treatments with electrical conductivities (EC) of O, 4.8, 9.6, and 14.4 mmhos/cm. After saline-water equilibration of a Brennan fine sandy loam soil (Typic Haplustalif), fertilizer treatments were applied in a factorial arrangement with N rates of O, 67, 133, and 200 mg/kg of soil and P rates of O, 20, 40, and 60 mg/kg of soil. No response was obtained from P fertilization. Significant interactions occurred for both dry-matter and protein-N yields with soil salinity and N supply treatments. Soil salinities of 5.3 and 6.6 mmhos/cm yielded the most dry matter and protein N, respectively, in the presence of N fertilizer. Reduction in soluble N (nonprotein) occurred at the most effi-cient levels of protein-N synthesis. Although N requirements decreased as soil salinity increased, N fertilization offset effects of salinity up to 9.6 mmhos/cm. Dry-matter and protein syntheses were seriously restricted at the 14.4 mmhos/cm salinity level; however, salinity levels did not restrict N absorption by coastal bermudagrass.—Copyright 1972, Biological Abstracts, Inc. W72-08138 EFFECT OF SOIL AIR MOVEMENT AND COM-PRESSIBILITY ON INFILTRATION RATES, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

Van Phuc, and H. J. Morel-Seytoux. Soil Science Society of America Proceedings, Vol 36, No 2, p 237-241, March-April 1972. 7 fig. 15

Descriptors: *Infiltration, *Unsaturated flow, *Permeability, *Wetting, *Soil water movement, Hydraulic conductivity, Zone of aeration. Identifiers: *Multiphase flow, Soil air displace-

Air flow and compressibility may affect signifi-cantly the infiltration rates and the saturation profiles of soils. When water infiltrates the soil, the air in the soil pores is pushed aside to make room for the water. With a lower no-flow boundary, air can only escape at the top, but its flow is impeded by water entering the soil. In the unsaturated (one-phase) flow theory two physical effects both of which tend to reduce infiltration are or which tend to reduce mindaton are glected, namely, the viscous resistance to airflow and the air compression ahead of the wetting front. Thus the two-phase flow theory, which includes these two effects, will necessarily predict lower infiltration rates than the unsaturated flow theory. So the infiltration curve for the semi-infinite medium calculated by the two-phase flow theory must, of necessity, lie below the curve that be predicted by the unsaturated (one-phase) flow theory. In numerical experiments, the wetting front never reached the lower boundary during the infiltration stage. The saturation profiles near the surface indicate a clear shift toward a drier state to allow air to escape, thereby reducing the capacity of the soil to imbibe water. (Knapp-USGS) W72-08201

THE CALCULATION OF HYDRAULIC

CONDUCTIVITY,
Agriculture Research Service, Phoenix, Ariz. ater Conservation Lab. R. D. Jackson.

Soil Science Society of America Proceedings, Vol 36, No 2, p 380-382, March-April 1972. 2 fig, 1 tab,

Descriptors: *Hydraulic conductivity, *Unsaturated flow, *Soil water movement, Moisture content, Statistical methods, Laboratory tests.

Methods for calculating hydraulic conductivities of porous materials proposed by Marshall and by Millington and Quirk are similar except for the pore interaction term. This term is constant in the Marshall method. Equations for the two methods differ only by the exponent of the pore interaction term, which is 0 for Marshall's method and 4/3 for Millington and Quirk's. Data for four porous materials, for which the hydraulic conductivities. pressure heads, and water contents were determined on the same sample, were used in a statistical procedure to obtain a best fit value for the exponent. An exponent of 1 adequately predicted the measured conductivities. With this exponent, hydraulic conductivities for a field soil were calculated from a laboratory-determined pressure head-water content relation. Calculated and measured conductivities agreed to within the limits of error of measurement. (Knapp-USGS) W72-08205

SOLUBILITY AND SOLUBILITY PRODUCT OF GYPSUM IN SOIL SOLUTIONS AND OTHER AQUEOUS SOLUTIONS, Auburn Univ., Alabama. Dept. of Agronomy and

Soils

A. C. Bennett, and F. Adams.

Soil Science Society of America Proceedings, Vol 36, No 2, p 288-291, March-April 1972. 2 fig, 3 tab,

Descriptors: *Gypsum, *Solubility, *Water chemistry, *Sulfates, *Soil water, Solutes, Chemi-

cal potential, Soil chemistry, Aqueous solutions, Electrolytes. Identifiers: *Solubility product (Gypsum), *Soil solutions.

The solubility of gypsum was measured in several soils and dilute aqueous electrolytic media. The ionic strength of electrolytic media ranged from 0.059 to 0.314; the solubility product of gypsum in these solutions ranged from 0.0000213 to 0.0000279 and averaged 0.0000251. In soil solutions, the solubility product of gypsum ranged from 0.0000241 to 0.0000292 and averaged 0.0000273. The solubility product of gypsum in pure water was 0.0000258. The mean ionic activity coefficient of gypsum in solutions of different ionic strengths was computed using analytical data from aqueous elec-trolytic media and the known solubility product. The plot of this mean ionic activity coefficient versus the square root of gross solution ionic strength allowed accurate determination of the solubility product of gypsum in soil solutions using only analytical data. (Knapp-USGS) W72-08206

STEADY INFILTRATION FROM BURIED, SUR-FACE, AND PERCHED POINT AND LINE SOURCES IN HETEROGENEOUS SOILS: 1.

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics. J. R. Philip.

Soil Science Society of America Proceedings, Vol 36, No 2, p 268-273, March-April 1972. 11 ref.

Descriptors: *Infiltration, *Steady flow, *Irriga-tion water, *Subsurface irrigation, *Soil water movement, Porous media, Soil moisture, Unsaturated flow, Numerical analysis, Hydraulic conduc-

Identifiers: *Steady infiltration.

The quasilinearized steady infiltration equation is generalized to apply to heterogeneous soils with conductivity depending exponentially on both moisture potential and depth. Mathematical developments, including a theorem connecting surface and buried source solutions, follow closely those established previously for homogeneous soils. Solutions are found for buried, surface, and perched point and line sources. Physically relevant solutions are limited to the following ranges of the dimensionless coefficient of dependence of conductivity on depth: for buried and surface sources, zero or larger; for perched point sources, -1 or smaller; for perched line sources, <-1. The homogeneous medium with the zero coefficient is an extreme case for existence of buried and surface source solutions. Perched source solutions (relevant to subirrigation) exist only for soils with conductivity increasing rapidly with height above the impermeable base. (Knapp-USGS) W72-08207

PORE SIZE DISTRIBUTIONS OF SOILS FROM MERCURY INTRUSION POROSIMETER

Oregon State Univ., Corvallis. Dept. of Soil

N. K. Nagpal, L. Boersma, and L. W. DeBacker. Soil Science Society of America Proceedings, Vol 36, No 2, p 264-267, March-April, 1972. 5 fig, 3 tab, 17 ref.

Descriptors: *Porosity, *Instrumentation, *Soil physical properties, Porous media, Permeability, Laboratory tests. Identifiers: *Porosimeters (Mercury intrusion).

Soil water characteristic curves can be derived from pore-size distribution curves obtained by the mercury intrusion porosimeter technique. Mercury is forced under pressure into oven-dried and evacuated samples. The pressure is increased in discrete steps and the volume of pores intruded between pressure steps is obtained. This technique

allows analysis of more samples per day than stan-dard methods. Soil water characteristic curves of dard methods. Soil water characteristic curves of eight soils ranging in clay content from 0 to 57% were determined by the pressure plate and pressure membrane technique and compared with similar curves derived from mercury intrusion data. Results obtained by the two techniques agreed well for soils which do not shrink or swell with changes in water content, but not for samples with swelling clays. (Knapp-USGS) W72-08208

INSTRUMENTATION EFFECTS ON ERRORS IN NUCLEAR METHODS FOR SOIL WATER AND DENSITY DETERMINATION, Oklahoma State Univ., Stillwater. Dept. of

Soil Science Society of America Proceedings, Vol 36, No 2, p 261-264, March-April 1972. 10 ref.

Descriptors: *Calibrations, *Nuclear moisture meters, *Instrumentation, *Soil moisture meters, Muclear meters, Soil water, Radioactivity techniques, Density.

Equations for calculating the errors of determina-tion of the ratio commonly used in soil moisture determination by neutron scattering are discussed. Some of the errors due to random event counting, dead time, and drift phenomena not fully compensated for by the ratio method are held to 0 at the point where the count in the soil medium is equal to the count in the standard. It is recommended that this point express shows the conter of the that this point appear above the center of the calibration curve. (Knapp-USGS)
W72-08209

TRANSPORT OF PICLORAM IN RELATION TO SOIL PHYSICAL CONDITIONS AND PORE-WATER VELOCITY, Oklahoma State Univ., Stillwater. Dept. of

Agronomy.
For primary bibliographic entry see Field 05B.

NUMERICAL ANALYSIS OF DRAINAGE OF A NUMERICAL ANALYSIS OF DRAINAGE OF A HETEROGENEOUS POROUS MEDIUM, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. K. K. Watson, and F. D. Whisler. Soil Science Society of America Proceedings, Vol 36, No 2, p 251-256, March-April 1972. 11 fig, 1 tab, 14 ref.

Descriptors: *Soil water movement, *Drainage, *Numerical analysis, Percolation, Mathematical models, Unsaturated flow, Hydraulic conductivi-ty, Seepage, Pressure head. Identifiers: Gravity drainage.

Gravity drainage of a heterogeneous porous medium was analyzed using a numerical solution of the flow equation. The medium was assumed to exhibit scale heterogeneity, specifically defined in terms of a linear variation of the saturated hydraulic conductivity with depth. Within the restrictions imposed by scale heterogeneity, the hydrologic characteristics were chosen so that their form represented real data. The spatial variation of the hydrologic characteristics was initially defined in terms of the air entry value of the medium and an empirical relationship between the air entry value and the saturated hydraulic conductivity. Pressure head and water content profiles were computed for three hydraulic conductivity distributions in which the conductivity decreased with depth. The pressure head profiles for these distributions show zones of positive pressures and the slow decay of these pressures during drainage. (Knapp-USGS) W72-08211

SOURCE-DETECTOR GEOMETRY EFFECT ON NEUTRON PROBE CALIBRATION, Oklahoma State Univ., Stillwater. Dept. of

G. N. McCauley, and J. F. Stone. Soil Science Society of America Proceedings, Vol 36, No 2, p 246-250, March-April 1972. 3 fig, 6 ref.

Descriptors: *Calibrations, *Nuclear moisture meters, *Instrumentation, *Soil moisture meters, Moisture meters, Nuclear meters, Soil water. Identifiers: *Neutron detectors.

The midpoint of the anode wire and the center of the sensitive volume of a boron tirfluoride neutron detector tube coincide and should be expected to detector tube coincide and should be expected to do so for all such detector tubes of symmetrical construction. The effect of position of the neutron source on the count rate in hydrogenous media was studied. Four hydrogenous media were used: urea, aluminum sulphate, water, and the paraffin shield for the probe. Second-degree curves fit the data of count rate vs. distance between source and reference point. The center of the sensitive volume coincided with the point of greatest count rate. The center was also the position for greatest sensitivity to water content. Changes of source position as small as 0.5 cm from the position aroriginal calibration will significantly change the calibration curve. Users can detect such changes by monitoring ratios of readings in two different hydrogenous media in the laboratory. Any such by monitoring ratios of readings in two different hydrogenous media in the laboratory. Any such change in source-detector geometry will produce a change in ratio. Positional changes may be the result of either a source movement or replacement of detector tube with one of different dimensions. (Knapp-USGS) W72-08212

SCALING OF HORIZONTAL INFILTRATION INTO HOMOGENEOUS SOILS, California Univ., Davis. Dept. of Water Science

K. Reichardt, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol
36, No 2, p 241-245, March-April 1972. 9 fig, 1 tab,
8 ref.

Descriptors: *Infiltration, *Soil water movement, *Diffusion, Wetting, Hydraulic similitude, Diffusivity, Hydraulic conductivity, Percolation, Soil properties, Porous media, Numerical analysis, Regression analysis. Identifiers: Similar media.

Horizontal infiltration of water into uniform airdry soil columns was examined experimentally and theoretically. The applicability of the similar-media concept to the scaling of soils having a wide textural range is studied. The microscopic characteristic length may be determined from plots of the tensus length may be determined from plots of the distance to the wetting front as a function of the square root of time. These plots coalesce into one line when expressed in terms of scaled coordinates. If the soil-water diffusivity of one soil is known, values of the microscopic characteristic length can be used to estimate the soil-water diffusivity of the other soils. (Knapp-USGS) W72-08213

SWELLING PRESSURES, ELECTRIC POTENTIALS, AND ION CONCENTRATIONS: THEIR ROLE IN HYDRAULIC AND OSMOTIC FLOW

Agricultural Research Service, Beltsville, Md.

No. D. Kemper, I. Shainberg, and J. P. Quirk.
Soil Science Society of America Proceedings, Vol
36, No 2, p 229-236, March-April 1972. 5 fig, 1 tab,
9 ref.

Descriptors: *Osmosis, *Clays, *Osmotic pressure, *Chemical potential, Expansive clays, Electro-osmosis, Adsorption, Aqueous solutions, Ion exchange, Ion transport, Diffusion, Aquitards, Filtration.

The mechanisms of convective transport through porous media are outlined using mass balance and force balance equations. Pressure differences across compressible porous media cause clay to concentrate at the outflow side until the resulting osmotic pressure gradient balances the hydraulic pressure gradient. The resulting gradient in mobile adsorbed cations causes a diffusion potential which moves solution by electro-osmosis to the outflow side. When potentials in the pores are appreciable, solution concentration differences across incompressible media are translated into a hydraulic pressure gradient of the pores which moves the solution to the high concentration side. Similar concentration differences across compressible porous media result in nonuniform clay distribution and diffusion potential gradients which cause electro-osmotic movement of solution to the high concentration side of the media. The mechanisms provide an explanation for the rapid rates of osmotic flow observed in response to solute concentration gradients across memto solute concentration gradients across melbranes and other porous media. (Knapp-USGS) W72-08214

OPTIMAL IRRIGATION QUANTITY AND FREQUENCY Hawaii Univ., Honolulu. Dept. of Agricultural Enincering. For primary bibliographic entry see Field 03F.

SOIL STRUCTURE: ITS MAINTENANCE AND IMPROVEMENT,
Reading Univ. (England). Dept. of Soil Science.
E. W. Russell.

J Soil Sci. 22 (2): 137-151. 1971.

Identifiers: Bonding, Collapse, Formation, Maintenance, Particle, Pore, Soil, Stabilization, Struc-

Factors involved in the creation and stabilization of structural pores, pores that are wider than those present in the soil when it is well puddled and at present in the soil when it is well puddled and at maximum bulk density, are discussed. Major mechanisms creating structure are shrinkage during drying, channels left by dead and decomposed plant roots, burrowing and channelling activities of larger soil fauna, and the passing of cultivation elements through the soil. Collapse of pores may be due to flaking or slaking off of the pore walls, burning of west complex troffice and particle be due to flaking or slaking off of the pore walls, slumping of wet crumbs, traffic, and particle dispersion due to clay particles deflocculating and dispersing in solution. Stabilization against wetting can be obtained by the presence of a particle-bonding agent. Clay particles and certain humus fractions, under certain conditions, bond sand and silt particles that, when dry, resist slumping on wetting. Pore-size and crumb-size distribution, the measurement of soil stability and strength, and the importance of soil structure in agriculture, are also importance of soil structure in agriculture, are also discussed.--Copyright 1972, Biological Abstracts, Inc. W72-08370

SOIL PROFILE GRAVEL LAYERS: I. EFFECT SOIL PROFILE GRAVEL LAYERS: I. EFFECT ON WATER STORAGE, DISTRIBUTION, AND EVAPORATION, Southwestern Great Plains Research Center, Bushland, Tex. Paul W. Unger.

Soil Sci Soc Amer Proc. 35 (4): 631-634. 1971. Illus. Identifiers: Distribution, Evaporation, Gravel, Layers, Profile, Soil, Storage, Water.

A gravel layer placed on or below the surface of laboratory soil columns markedly influenced water distribution, retention, and evaporation. In the field, plots with gravel on or 5 cm below the surface contained more water than check plots, while plots with gravel 15 or 25 cm below the surface contained less .- Copyright 1972, Biological Abstracts, Inc. W72-08394

DEEP PERCOLATION THROUGH PULLMAN SOIL IN THE SOUTHERN HIGH PLAINS, Southwestern Great Plains Research Center. V. S. Aronovici, and A. D. Schneider.

Group 2G—Water in Soils

Journal of Soil and Water Conservation, Vol 27, No 2, p 70-73, March-April 1972. 3 fig, 3 tab, 7 ref.

Descriptors: *Deep percolation, *Infiltration, *Recharge, *Soil-water-plant relationships, *Great Plains, Percolation, Texas, Permeability, Caliche, Seepage, Unsaturated flow, Hydraulic conductivity, Root zone. ty, Root zone. Identifiers: High Plains, (Tex).

Soil water measurements from deep borings were used to estimate deep percolation through Pullman clay loam, the major fine-textured soil in the Southern High Plains, Texas. Sediments beneath native grassland showed no evidence of deep per-colation. Sediments underlying soil that had been dryland cropped for more than 50 years contained less than 1 foot of percolated water between the 6-and 17-foot depths. Fields irrigated with graded furrows for as long as 20 years showed 2 feet of percolated water or less, but sediments underlying level borders irrigated the same length of time contained nearly 5 feet of percolated water. Deep percolation does not completely penetrate dry sedi-ments overlying the Ogallala formation and likely contributes little to groundwater recharge in the region. (Knapp-USGS) W72-08417

THE INFLUENCE OF MULCHING WITH PLASTICS UPON THE THERMIC AND WATER CONDITIONS IN SOIL, (IN RUMANIAN), Institutul Agronomic, Bucharest (Rumania).

B. Manescu, and Ruxandra Ciofu. Lucr Stiint Inst Agron N Balcescu Ser B. 13: 63-T2, 1970. Illus. English summary.
Identifiers: Cucumber-D, Ethylene, Garden,
Heat, Humidity, Lettuce-D, Loss, *Mulching,
Plastics, Potato-D, Infrared radiation, Reduced,
*Soils, Thermic, Transparent.

The experiment was carried out with early potatoes, cucumbers and garden lettuce. Trans-parent and black polyethylene increased soil temperature. Mulching with plastics modified the caloric balance (reduced the IR radiation and decreased heat losses by evaporation). The humidity and air capacity in covered soil had higher values.—Copyright 1972, Biological Abstracts, Inc. W72-08488

2H. Lakes

ECOLOGICAL ASPECTS OF GROWTH IN AFRICAN CICHLID FISHES,
Ministry of Agriculture, Fisheries and Food,
Lowestoft (England). Fisheries Lab.

T.D. Iles. Journal In Conseil, Conseil Permanent International pour Exploration de la Mer. 33 (3): 363-385. 1971. Illus.

Descriptors: *Plankton.
Identifiers: *African cichlid, Fishes, Ecological aspects, Food, Growth, Haplochromis-Virginalis, Migration, Spawning, Tilapia, *Lake Nyasa.

Most of the information on growth for African cichlid fish refers to members of the genus Tilapia, the most important commercially, but which represents only a small part of the adaptive range covered by the family as a whole. Species of the genus Haplochromis are endemic to Lake Nyasa; they feed on zooplankton, and some have a well-defined breeding season. An analysis of suitable length-frequency data allowed a comparison of growth parameters with those of other species of cichlids which indicates that, although these fish are comparatively small, they do not reach maturiare comparatively small, they do not reach maturity until their third yr; as they have a high relative growth rate, they become adult late in their growth history. The data for one of the species of Nyasan zooplankton-feeding Haplochromis, H. virginalis, indicate that the adult part of the population leaves the inshore feeding area some time before the spawning period and returns later to breed. This is seen as a stage in the process by which the open waters of the lake are colonized; a second species in the same group appears to spend the whole of the year preceding first breeding in the open lake, returning to inshore waters to breed each year. Both these species are widespread and abundant, and a link between their migratory habits (rarely found in other Nyasan cichlids) and the ecological success represented by this abundance is sug-gested, one that can be applied to certain species of Tilapia in the same lake. It is also suggested that or I hapfail in the same lake. It is also suggested that this migration relieves competition among the more sedentary species which share the same zooplankton food resource.—Copyright 1972, Biological Abstracts, Inc. W72-07897

VARIOUS FORMS OF EUTROPHICATION OF EASTERN ALPINE LAKES, For primary bibliographic entry see Field 05C. W72-07905

MEASUREMENT OF CURRENTS IN LAKE MEAD WITH THE DEEP WATER ISOTOPIC CURRENT ANALYZER (DWICA), Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 07B. W72-07918

WATER CHARACTERISTICS AND DIATOM FLORA OF THE SHIGA LAKE GROUP, (IN JAPANESE). Shinshu Univ., Matsumoto (Japan). Dept. of Geology. Seiko, Tamura, Yutaka, Saito, and Yasuyo, Bull Inst Nat Educ Shiga Heights. 9. 77-91. 1970.

Descriptors: *Diatoms, *Lakes. Identifiers: Flora, *Japan, Shiga, *Lake.

Illus. Map. English summary.

A preliminary report is given on limnological studies particularly on the relationship between water conditions and diatom communities.-Copyright 1972, Biological Abstracts, Inc. W72-07944

NITROGENASE ACTIVITY IN KEYSTONE RESERVOIR OKLAHOMA, Oklahoma State Univ., Stillwater For primary bibliographic entry see Field 05C. W72-07945

CHEMICAL LIMNOLOGY OF A DEVELOPING RESERVOIR (LAKE MEREDITH) IN THE TEXAS PANHANDLE, West Texas State Univ., Canyon. For primary bibliographic entry see Field 05C. W72-07947

INTRAZOOPLANKTON PREDATION BY MESOCYCLOPS EDAX AT NATURAL PREY DENSITIES, Ithaca Coll., N.Y. Dept. of Biology. For primary bibliographic entry see Field 05C. W72-07949

THE CHEMICAL INVESTIGATION OF RECENT LAKE SEDIMENTS FROM WISCONSIN LAKES AND THEIR INTERPRETATION. Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.

PHYSICOCHEMICAL PROPERTIES OF THE WATER OF REED-BELTS IN MIKOLAJSKIE, TALTOWISKO, AND SNIARDWY LAKES, Polish Academy of Sciences, Warsaw. Dept. of Applied Limnology; and Polish Academy of Sciences, Warsaw. Inst. of Ecology.

For primary bibliographic entry see Field 05C.

Lake Survey Center, Detroit, Mich. For primary bibliographic entry see Field 02C. W72-07975 GREAT LAKES ICE ATLAS.

VALCOUR HARBOR, LAKE CHAMPLAIN, NEW YORK (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, New York. For primary bibliographic entry see Field 08A. W72-08003

INTERACTIONS OF DISSOLVED AND PARTICULATE NITROGEN IN LAKE METABOL-ISM, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station; and Michigan State Univ., Hickory Corners. Dept. of Botany and Plant Pathology. Plant Pathology.
For primary bibliographic entry see Field 05C.
W72-08048

NITROGEN FIXATION BY BACTERIA IN LAKE MIZE, FLORIDA AND IN SOME LACUS-TRINE SEDIMENTS, Florida Univ., Gainesville. Dept. of Environmental Engineering. For primary bibliographic entry see Field 05C. W72-08052

RECLAMATION OF PONDS, LAKES, AND STREAMS WITH FISH TOXICANTS: A REVIEW,
Bureau of Sport Fisheries and Wildlife, La
Crosse, Wis. Fish Control Lab. For primary bibliographic entry see Field 05C. W72-08059

RESPONSES OF SOME ESTUARINE FISHES TO INCREASING THERMAL GRADIENTS, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Resources; and Ichthylogical Association, Middletown, Del. For primary bibliographic entry see Field 05C. W72-08061

FACTORS LIMNOLOGICAL AFFECTING PESTICIDE RESIDUES IN SURFACE WATERS, Iowa State Water Resources Research Inst., Ames. For primary bibliographic entry see Field 05B. W72-08068

MIXING OF DENSITY-STRATIFIED IMPOUND-MENTS WITH BUOYANT JETS, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources. For primary bibliographic entry see Field 05B. W72-08136

SOME DATA ON THE DISTANCE-NEIGHBOUR SOME DATA ON THE DISTANCE-NEIGHBOUR FUNCTION FOR RELATIVE DIFFUSION, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources. For primary bibliographic entry see Field 05B. W72-08140

SPECIES DIVERSITY OF NET ZOOPLANKTON AND PHYSIOCHEMICAL CONDITIONS IN KEYSTONE RESERVOIR, OKLAHOMA, Wisconsin State Univ., Superior. Dept. of Biology. For primary bibliographic entry see Field 05A. W72-08143

AN INVESTIGATION OF THE ADVANTAGES OF AUTUMN AND SPRING STOCKING WITH

BROWN TROUT SALMO TRUTTA L. IN THE YORKSHIRE RESERVOIR, Ouse and Hull River Authority, Leeds (England).

R. G. Templeton. J Fish Biol. 3 (3): 303-324, 1971. Illus.

Identifiers: Autumn, England, Reservoir, Salmotrutta, Spring, Trout, Yorkshire.

Batches of trout have been introduced into Chelker Reservoir in Yorkshire in the autumn and spring since the 1870's for angling purposes. Six batches of tagged, hatchery-reared S. trutta L. were introduced from autumn 1966 to spring 1969. During the angling season fish introduced in the spring give better catches than those stocked in the autumn. At the beginning of the season the larger fish in the spring batch are caught more often than the smaller fish from the same batch. The larger fish in the autumn batch are caught more often than the smaller fish from that batch throughout the season. The population, available to the angler from the shore was estimated to be 1491 in 1968, with 722 fish/km of shoreline. More fish survive to a second year in the reservoir than is apparent from the number of tags returned. Fish introduced in the spring usually begin growing before those in-troduced in the autumn, thereafter growth rates varied. The growth rate was independent of the number of fish stocked up to the numbers put in. Batches of tagged trout were retained at the hatchery up to 9 mo. to gain relevant experience of post-tagging mortalities, tag loss rate and effect of tags on growth.--Copyright 1972, Biological Abstracts, Inc. W72-08217

FALLOUT MN-54 AND ZR-95 IN WATER AND FISHES OF FOUR LAKES IN NORTHERN ITA-

European Atomic Energy Community, Ispra (Italy). Protection Service. For primary bibliographic entry see Field 05C. W72-08236

MULTI-LAYERED MODELS OF CURRENTS, TEMPERATURE, AND WATER QUALITY PARAMETERS IN THE GREAT LAKES.

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.

For primary bibliographic entry see Field 06A. W72-08267

INVESTIGATIONS LIMNOLOGICAL TEXAS IMPOUNDMENTS FOR WATER QUALITY MANAGEMENT PURPOSES, Texas Univ., Austin. Center for Research in Water For primary bibliographic entry see Field 05G.

WATER QUALITY PROTECTION FOR IN-LAND LAKES IN WISCONSIN: A COM-PREHENSIVE APPROACH TO WATER POLLU-

Wisconsin Univ., Madison. School of Natural Resources. For primary bibliographic entry see Field 05G. W72-08349

KINETICS OF ALGAL GROWTH IN AUSTERE

MEDIA, Albany County Sewer District, N. Y. For primary bibliographic entry see Field 05C. W72-08376

SYSTEMATIC BEACH PROFILE STUDY OF EASTERN LAKE MICHIGAN (1970-1971), Western Michigan Univ., Kalamazoo. R. A. Davis, Jr.

Available from NTIS, Springfield, Va. 22151 as AD-733 945, Price \$3.00 paper copy, 95 cents microfiche. Annual Status Report, August 15,

1971. 48 p, 24 fig, 17 ref, append. Contract No. Army Coastal Engrg. Res. Center - DACW 72-70-C-0037.

Descriptors: *Beaches, *Profiles, *Lake Michigan, *Lake morphology, *Lake shores, Water levels fluctuations, Sediment transport, Beach erosion, Currents (Water). Identifiers: Research projects, Beach profiling.

This is the first beach profiling project of Lake Michigan. Profiling was initiated at three southeastern beaches in June 1968. Two years later a study was made of the entire eastern coast. Data were collected from August 1970 through July 1971 at 17 beaches between Point Betsie and Lakeside, Michigan. Profiling during extreme changes in lake level provides data to enable prediction of changes in beach geometry during future lake level fluctuations, and are valuable in establishing land use plans and zoning ordinances for coastal areas. (Woodard-USGS)

LIMNOLOGICAL DATA FROM LAKE ST. CLAIR, 1963 AND 1965, National Marine Fisheries Service, Ann Arbor,

Mich. Great Lakes Fishery Lab. J. K. Hiltunen.

Available from NITS, Springfield, Va. 22151 as COM-71-00644 Price \$3.00 paper copy; 95 cents microfiche. National Oceanic and Atmospheric Administration Data Report 54, February 1971. 45 p, 1 fig, 22 tab, 2 ref.

Descriptors: *Lakes, *Limnology, *Water analysis, *Benthos, *Michigan, Hydrologic data, Data collections, Chemical analysis, Water temperature, Water quality, Fish, Sediments.

Identifiers: *Lake St. Clair (Mich.).

On May 5 and 24-25, 1963, and July 26-28, 1965, biologists of the Bureau of Commercial Fisheries Biological Laboratory, Ann Arbor, Mich., and Sandusky, Ohio, collected limnological and fishery data at 14 stations in Lake St. Clair. The limnological collections included records of water transparency (by Secchi disc), water temperature, water samples for chemical analysis, and bottom samples for the analysis of the macrobenthos. The water samples were analyzed for sodium, potassi-um, calcium, chloride, sulfate, and silica. (Woodard-USGS) W72-08415

THE CASPIAN SEA. A BIBLIOGRAPHY, (KASPIYSKOYE MORE. REFERATIVNYY

SBORNIK), Akademiya Nauk SSSR, Moscow. Vsesoyuznyi Institut Nauchnoi i Tekhnicheskoi Informatsii. K. K. Gyul', T. N. Lappalainen, and V. A. Polushkin

VINITI, Moscow, 1970. 236 p.

Descriptors: *Abstracts, *Lakes, Meteorology, Geomorphology, Geology, Hydrography, Naviga-tion, Hydrologic aspects, Water balance, Heat balance, Salt balance, Water chemistry, Water level fluctuations, Streamflow, Currents (Water), Waves (Water), Ice, Sedimentation, Aquatic life,

waves (water), ite, Sedimentation, Aquate me, Investigations. Identifiers: "USSR, "Caspian Sea, Black Sea, Aral Sea, Sea of Azov, Volga River, Kara Bogaz Gol, Biogenous components, Tectonics, Expedi-

This monograph contains 1,850 abstracts of scientific papers on the Caspian Sea, published in Russian of in the language of non-Russian nationalities. Topics include investigations of physical, ties. Topics include investigations of physical, chemical, biological, and geological processes taking place in the sea, and studies of the geography, geology, geomorphology, and hydrography of the region. A geographical and subject index is appended. (Josefson-USGS)
W72-08424

REGIME OF LAKES, (REZHIM OZER).

Trudy Vsesoyuznogo simpoziuma po osnovnym problemam presnovodnykh ozer, Vilnius, 1970. Vol. 1, 498 p.

Descriptors: *Limnology, *Lake, *Lake morphology, *Lake morphometry, *Lake basins, Lake sediments, Lake ice, Water balance, Water chemistry, Water quality, Water temperature, Water levels, Heat balance, Salt balance, Bodies of water, Reservoirs, Ponds, Rivers, Meteorology, Percepting focilities. Recreation facilities.
Identifiers: *USSR, *Lithuanian SSR, Lake clas-

sification, Water exchange, Metalimnion

The purpose of the All-Union Symposium on Basic Problems of Freshwater Lakes, held in Vil-nius, Lithuania, May 25-29, 1970 was (1) to clarify the role of lakes in the national economy and the importance of limnological studies for land reclaimportance of limnological studies for land reclamation and rational use of water resources; (2) to develop methods to increase fish production of lakes; and (3) to study the origin and development of lakes and the composition of lake sediments. The papers presented at the symposium are compiled in 3 volumes. Volume I contains 44 papers grouped under the following subject headings: physics of lakes (3 papers); chemistry of lakes (10 papers); thermal regime of lakes (6 papers); ylydrologic regime of lakes (13 papers); and general problems (12 papers). (See also W72-08432 and W72-0843) (Joselson-USGS) W72-08431

HISTORY OF LAKES (ISTORIYA OZER).

Trudy Vsesoyuznogo simpoziuma po osnovnym problemam presnovodnykh ozer, Vilnius, 1970. Vol. 2, 623 p.

Descriptors: *Paleolimnology, *History, *Lakes, *Lake stages, *Lake basins, Lake shores, Bogs, Bottom sediments, Glacial sediments, Glaciation, Quaternary period, Pleistocene epoch, Recent epoch, Dating, Palynology, Mineralogy, Trace elements, Aquatic life, Aquatic animals, Aquatic

Identifiers: *USSR, *Lithuanian SSR, *Glacial lakes, Lake classification, Paleogeography, Neogene period.

Volume II contains 49 papers grouped under the following subject headings: structure and age of Pleistocene lake sediments (12 papers); development of glacial lakes (7 papers); development of modern lakes (18 papers); composition of lake sediments (7 papers), and flora and fauna of lake sediments (5 papers). (See also W72-08431) (Josefson, IJSGS) W72-08432

BIOLOGY OF LAKES (BIOLOGIYA OZER).

Trudy Vsesoyuznogo simpoziuma po osnovnym problemam presnovodnykh ozer, Vilnius, 1970. Vol. 3, 345 p.

Descriptors: "Hydrobiology, "Lakes, "Aquatic productivity, "Aquatic populations, "Aquatic life, Aquatic plants, Aquatic algae, Aquatic bacteria, Phytoplankton, Aquatic animals, Zooplankton, Invertebrates, Crustaceans, Fish, Fish reproduction, Fish management, Benthos, Organic matter, Trace elements, Birds.

Identifiers: "USSR, "Lithuanian SSR, Karstic lakes, Fish production, Macrophytes, Geobotany, Aviculture.

Volume III contains 32 papers grouped under the following subject headings: biological productivity in bodies of water (1 paper); aquatic bacteria and phytoplankton (5 papers); hydromacrophytes (7 papers); 200plankton (4 papers); benthos (3 papers); ichthyofauna, FISH PRODUCTION AND FISH MANAGEMENT (11 papers); and ornithofauna (1 paper). (See also W72-08431) (Josefson-USGS) W72-08433

Group 2H-Lakes

FOOD OF TWO COHABITING TIDE-POOL

Lummi Aquacult. Project, Marietta, Wash. R. Nakamura.

R. Nakamura.

Journal of the Fisheries Research Board of Canada, Vol 28, No 6, p 928-932. 1971.

Identifiers: Amphipods, Annelids, Chironomids, Copepods, *Cottidae, *Food habits, Isopods, Oligocottus maculosus, Oligocottus snyderi, Pools.

The organisms found on 7 dates in the stomachs of 2 cottids (Oligocottus maculosus and O. snyderi) cohabiting 4 rocky tide pools on the west coast of Vancouver Island were the same except for 1 minor item. Quantitatively, a number of dif-ferences were present. For the major food items, the interspecific differences in relative composition of the diets were greatest for amphipods and copepods. Lesser differences are seen for an-nelids, isopods, and chironomid larvae. However, these were more likely a reflection of differences in microhabitat and behavior rather than interspecific competition for food.—Copyright 1972, Biological Abstracts, Inc.

RESERVOIR FISHERIES AND LIMNOLOGY. For primary bibliographic entry see Field 08I. W72-08474

2I. Water in Plants

ATMOSPHERIC AMMONIA: ABSORPTION BY

PLANT LEAVES, Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div For primary bibliographic entry see Field 05B.

DEUTERIUM CONTENT OF PEAT AS A PALEOCLIMATIC RECORDER, Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab For primary bibliographic entry see Field 02K.

ARE SOME BACTERIA TOXIC FOR MARINE

ALGAE, Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 05C.

EVALUATION OF COTTON RESPONSE TO RATES, SOURCES, AND TIMING OF NITROGEN APPLICATION BY PETIOLE

ANALYSIS, Alexandria Univ. (Egypt). Dept. of Soil Sciences. For primary bibliographic entry see Field 03F.

INFLUENCES OF WATER MANAGEMENT AND FERTILITY ON RICE GROWTH AND

California Univ., Davis. Dept. of Agronomy. For primary bibliographic entry see Field 03F. W72-08113

NITROGEN CONTENT OF GRAIN AS IN-FLUENCED BY WATER SUPPLIED TO THE Oklahoma State Univ., Stillwater. Dept. of Agronomy.

For primary bibliographic entry see Field 03F. W72-08125

NOTROPIS MEKISTOCHOLAS, A NEW HER-BIVOROUS CYPRINID FISH ENDEMIC TO

THE CAPE FEAR RIVER BASIN, NORTH CAROLINA, Florida Technological Univ., Orlando. Inst. of Fresh Water Ecology. Franklin F. Snelson, Jr.

opeia. 1971 (3): 449-462. 1971. Illus. Identifiers: Basin, Cape, Fear, Cyprinid, Dionda, Distribution, Endemic, Fish, Herbivorous, Luxilus, New, North-Carolina, Notropis-Alborus, Notropis-Anogenus, Notropis-Stramineus, River,

N. mekistocholas is described as a new species. It is unusual within the genus in exhibiting heris unusual within the genus in exhibiting her-bivorous adaptations-an elongate, convoluted in-testine and black peritoneum. It is compared with N. alborus and N. procne, 2 sympatric relatives that differ in lacking herbivorous modifications, in having 7 rather than 8 anal rays, and in numerous other features. N. mekistocholas is the first known endemic species from the Cape Fear drainage in North Carolina. It has a very restricted distribu-tion in the east-central Piedmont province, being known from only 4 streams in Chatham and Harnett counties. Intestinal modifications suggestive of an herbivorous diet are reported for N. anogenus and some species of the subgenus Luxilus. There is no evidence to suggest that N. mekistocholas should be aligned with the southwestern genus Dionda, which contains herbivorous species superficially similar to Notropis species. Closest relatives of N. mekistocholas appear to be N. procne and N. stramineus.—Copyright 1972. Biological Abstracts, Inc. W72-08218

USE OF INCOMPLETE BLOCK REPLICATIONS IN ESTIMATING TOBACCO-MOSAIC VIRUS.

National Bureau of Standards, Washington, D.C. For primary bibliographic entry see Field 07C. W72-08230

LIFE HISTORY OF GALAXIAS DIVERGENS (SALMONOIDEA: GALAXIIDAE), Marine Dept., Wellington (New Zealand). C. L. Hopkins.

N Z J Mar Freshwater Res. 5 (1): 41-57. 1971. Illus. Identifiers: Food, Galaxias-Divergens, Galaxidae, History, Invertebrate, Life, Salmonoidea.

G. divergens Stokell is a small, bottom-dwelling fish inhabiting streams in the North Island and the northern part of the South Island. Its ecology is similar in many respects to that of G. vulgaris. The fry develop in the same environment as the adults, unlike the sea-going young of several other Galax-ias species. Spawning occurs in spring and summer, and at least some of the fish mature at the beginning of their second year. The maximum age attained seems to be about 3 yr, and the fish can reach a length of about 80mm in this time. The food consists mostly of small benthic inver-tebrates taken from both the stream bed and the drift fauna .-- Copyright 1972, Biological Abstracts, Inc. W72-08252

PROTOZOAN DISEASES OF THE FRY OF HERBIVOROUS FISHES.

Acta Vet Acad Sci Hung. 21 (1): 1-14. 1971. Illus. Identifiers: Aristichthys-Nobilis, Ciliat Ctenopharyngodon-Idella, Diseases, Fishe Flagellata, Fry, Herbivorous. Ciliata, Fishes,

Three Far Eastern herbivorous fish species, the grasscarp (Ctenopharyngodon idella), silver carp (Hypophthalmichthys mollitrix) and bighead (Aristichthys nobilis), were found to harbor the following 18 species of protozoa: Cryptobia branchialis, Spironucleus sp., Eimeria cheni, E. sinensis, Chloromyxum cyprini, Ch. nanum, Sphaerospora carassii, Myxobolus dispar, M. pavlovskii, M. drjagini, Myxidium sp., Chilodonel-

la cyprini, Ichthyophthirius multifiliis, Balantidium ctenopharyngodonis, Trichodinella epizootica, Trichodina spp., Apiosoma cylindriformis, Trichophrya sinensis. During the 7 yr since the in-Trichophrya sinensis. During the 7 yr since the introduction of the hosts some of the above protozoan parasites have shown a distinct pathogenicity. The simultaneous invasion of M. pavlovskii, C. branchialis, T. epizootica and A. cylindriformis has caused mass losses among the 20-30 mm long young fishes. Coccidiosis of the silver carp and bighead as well as sphaerosporosis and spironucleosis of the grasscarp may also cause economically important losses among the fishes, particularly among their fry "Convright 1972. particularly among their fry.--Copyright 1972, Biological Abstracts, Inc. W72-08463

ON THE OCCURRENCE OF OCTADECATETRAENOIC ACID IN THE SEED OILS OF WATER PLANTS, (IN ITALIAN), Pisa Univ. (Italy).

G. Lotti, and V. Averna. Riv Ital Sostanze Grasse. 48 (6): 326-330. 1971. En-

glish summary. Identifiers: Chromatography, IR, Oils, Plants, Seed, Spectra, Tetraenoic-acid, UV.

The seed oils of numerous water plants were examined by gas-chromatographic analysis and UV and IR techniques. The results showed in some oils the presence of less common acids, such as eicosadienoic and docosadienoic acids, and particularly of 6, 9, 12, 15-octadecatetraenoic acid, whose taxonomic significance is discussed.--Copyright 1972, Biological Abstracts, Inc. W72-08467

2J. Erosion and Sedimentation

COASTAL AND MOUNTAIN SLOPE INSTA-BILITY ON THE ISLANDS OF ST. LUCIA AND

Oueen's Univ., Belfast (Northern Ireland), Dept. of Geography. For primary bibliographic entry see Field 02G. W72-07955

SEDIMENTS AND HISTORY OF THE POST-GLACIAL TRANSGRESSION IN THE PERSIAN GULF AND NORTHWEST GULF OF OMAN, Kiel Univ. (West Germany). Geological-Paleon-M. Sarnthein.

Marine Geology, Vol 12, No 4, p 245-266, April 1972. 11 fig, 1 plate, 38 ref.

Descriptors: *Bottom sediments, *Paleohydrology, *Pleistocene epoch, *Stratigraphy, *Water level fluctuations, Paleoclimatology, Facies (Sedimentary), Sedimentation, Bathymetry. Identifiers: *Persian Gulf, *Gulf of Oman.

Large parts of the Persian Gulf recieve little recent sediment. In these areas bottom samples contain considerable quantities of parautochthonous relict sediments with radiocarbon ages of 7,000-13,000 years. The relict grains have a shallow water origin. The deepest traces of water-line sedimentation (ooliths, reef material) are found at the shelf break in water depths of 105-125 m. At the time of this deposition the Persian Gulf was essentially a dry, flat river valley. Between 100 and 65 m water depth, polymict coquinas, in the shallower part covered by thick unlithified aragonite mud, reflect a rapid transgressive migration of intertidal en-vironments. Behind the Central Swell a temporary lagoon was formed which filled with aragonite mud and some terrigenous deltaic sediments. Transgression standstill periods are indicated at 64-61 and 53-40 m by coarse, frosted quartz and ooid concentrations embedded in lithified aragonite mud. These, together with a fossil ridge and channel system, are interpreted as drowned relicts of strand dunes. The Late Pleistocene cli-mate, as evidenced by the absence of Zagros river

Erosion and Sedimentation—Group 2J

sediments, was probably more arid than the present day Persian Gulf climate. (Knapp-USGS) W72-07957

THE REVERSAL OF SAND WAVES IN THE BRISTOL CHANNEL.

Bristol Univ. (England).
A. B. Hawkins, and M. J. Sebbage.
Marine Geology, Vol 12, No 4, p M7-M9, April 1972. 2 fig.

Descriptors: *Sand waves, *Shoals, *Tides, Currents (Water), Sedimentary structures, Bottom sediments, Shallow water, Sand bars.
Identifiers: *Avonmouth (England).

Off Avonmouth (England), sand waves reverse their orientation during the tidal cycle. A detailed survey was made on October 5, 1971, to observe what changes took place during a tidal cycle. Both boats followed part of a sensitive fixed transit. The actual position along this transit was recorded by visual observations every two minutes. The first recorded trun showed a proposer of flood orients. recorded run showed a pronounced flood orienta-tion. Before the second recorded run the sand uon. Betore the second recorded run the sand waves had changed to ebb-oriented morphology. At run 3, the clear ebb orientation of the sand waves remained, despite this being during the flood tide. By run 4, the morphology had changed to become flood orientated and line 5 shows the flood morphology better established. (Knapp-W72-07958

BEACH STRUCTURES PRODUCED BY CRAB PELLETS.

Indian Inst. of Tech., Kharagpur. Dept. of Geology and Geophysics. A. Chakrabarti.

Sedimentology, Vol 18, No 1/2, p 129-134, March 1972, 7 fig. 7 ref.

Descriptors: *Beaches, *Sedimentary structures, *Crabs, *Stratigraphy, Burrows, Sands, Aquatic animals, Shores, Seashores. Identifiers: *Crab pellets.

Seashore crabs produce various designs with their fecal pellets. These structures are clearly associated with different parts of the beach. Mossy structures are found only in the upper beach part, along the high-water line, whereas concentricradiating and asteroid types are encountered in the middle beach area. In regions above mean hightide line, burrow openings are surrounded by loose sediments and are devoid of any patterns. In the lower beach zone such structures are lacking. If inwer peach zone such structures are lacking. If the beach materials are silty, fecal pellets con-gregate and stand out as knobby surfaces. Closer examination of such structures, if preserved in an-cient sediments, may not only hefp in delineating the ancient shoreline positions but also may help in demarcating littoral micro-environments. (Knapp-IISGS) USGS) W72-07963

GENESIS OF LAMINATED SAND AND GRADED RHYTHMITES IN STORM-SAND LAYERS OF SHELF MUD, Forschungsanstalt fuer Meeresgeologie und Meeresbiologie 'Senckenberg' in Wilhelmshaven (West Germany).

H. E. Reineck, and I. B. Singh.

Descriptors: *Sedimentation, *Deposition (Sediments), *Suspended load, *Sands, *Stratigraphy, Bottom sediments, Turbulence, Waves (Water),

Laminated sand and graded rhythmites -- so-called storm-sand layers—are found embedded in shelf mud. With decreasing energy of a storm, the sand eroded on the coast is transported away by the retreating waters into the open sea, and is retained in suspension because of the high wave energy of the rough sea. With decreasing wave energy, the

suspension clouds settle, forming sand layers. Because bottom currents are usually weak, the sediment deposited is not formed into ripples, but remained in the form of laminated sand. (Knapp-USGS) W72-07964

CLAY MINERALOGY OF BLACK SEA SEDI-MENTS, Heidelberg Univ. (West Germany). Sediment Research Lab.

Research Lao.
P. Stoffers, and G. Muller.
Sedimentology, Vol 18, No 1/2, p 113-121, March
1972. 4 fig, 2 tab, 6 ref.

*Bottom sediments, *Mineralogy, *Clay minerals, *Bottom sediments, *Mineralogy, *Provenance, Stratigraphy, Clays, Illite, Montmorillonite, Kaolinite, Mud, Stratigraphy, Pleistocene epoch, Paleohydrology. Identifiers: *Black Sea. Descriptors: *Paleoclimatology, *Clay minerals,

Illite is the most frequent clay mineral in the Black Sea surface sediments. Highest values are ob-tained in the northern and central Black Sea. Approaching the Anatolian coast, the illite portion gradually decreases at the expense of montmoril-lonite. Chlorite and kaolinite occur generally only in small quantities. The lateral changes in the composition of the clay minerals can easily be traced back to the petrology of a northern (rich in illite) and a southern (rich in montmorillonite) distributive area. In almost all cores a periodical fluctuation of the montmorillonite/illite ratio with depth may be related to the changing influence of the two distributive provinces during the Holocene and Late Pleistocene. Higher montmorillonite con-tents indicate arctic and subarctic climate periods in the northern distributive area during which the illite supply was diminished to a large extent. (K-napp-USGS) W72-07965

INTENSITY INTENSITY OF DEPOSITION FROM AVALANCHES AND THE LOOSE PACKING OF AVALANCHE DEPOSITS,

(England). Sedimentology Reading Univ. Research Lab.

J. R. L. Allen. Sedimentology, Vol 18, No 1/2, p 105-111, March 1972. 2 fig, 10 ref.

Descriptors: *Deposition (Sediment), *Sedimentation, *Debris avalanches, *Beds (Stratigraphic), *Sedimentary structures, Stratigraphy, Model stu-Identifiers: *Sedimentary packing.

An avalanche of granular solids deposits grains once its snout is arrested at the base of the surface of avalanching. During deposition the avalanche behaves as a settling column of dispersed partibehaves as a setting column of dispersed paid-cles; the surface of deposition within the column is marked by a distinct shadow, or continuity wave, which swiftly climbs the sliding mass. The high in-tensities of deposition expected from avalanches behaving in this manner correspond to degrees of packing in the deposits that are very nearly the loosest possible for natural materials. This explains why cross-stratified sediments have low strengths and are readily deformed. (Knapp-USGS) W72-07966

LINEAR SAND BANKS IN THE SOUTHERN

NORTH SEA, British Petroleum Co. Ltd., Sunbury-on-Thames

(England). Research Center. V. N. D. Caston. Sedimentology, Vol 18, No 1/2, p 63-78, March 1972. 11 fig, 1 tab, 15 ref.

Descriptors: *Sand waves, *Shoals, *Currents (Water), *Tides, *Ocean currents, Sediment transport, Bed load.
Identifiers: *North Sea, *Tidal currents.

The majority of the linear sand banks in the Norfolk Banks area of the southern North Sea are large-scale mobile bed forms in dynamic equilibriinge-scale mobile bed forms in dynamic equilibrium with the environments. Sand streams moving in opposing directions on either side of a bank are deflected to the right, upslope, and converge at the crestline; the asymmetry of a bank is a reflection of the dominance of one of the streams. Convergence of sand streams causes an accumulation of sand which results in the continuing growth of the bank parallel to the direction of flow of the tidal bank parallel to the direction of flow of the tidal currents. Migration of asymmetric banks is in the direction of the steeper side; the predominant direction is to the northeast, but the opposing movement of sand streams may magnify localized irregularities into a complex 'S' shaped bank surrounding a pair of ebb and flood channels. The apices of this bank may eventually disappear leaving a line of en echelon banks. (Knapp-USGS) W72-07967

SEDIMENTATION IN THE ICE-CONTACT ENVIRONMENT, WITH EXAMPLES FROM SHROPSHIRE (ENGLAND), Alberta Univ., Edmonton. Dept. of Geography.

J. Shaw.

Sedimentology, Vol 18, No 1/2, p 23-62, March 1972. 14 fig, 8 tab, 50 ref.

Descriptors: *Sedimentation, *Glacial drift, *Alluvium, *Facies (Sedimentary), Stratigraphy, Deposition (Sediments), Sediment transport, Regimen.

Identifiers: *Glacial drift (Ice-contact). *Shropshire (England).

Glacial sedimentation in Shropshire, England, occurred in the ice-contact regimen. In the ice-contact environment, the subdrift topography and the direction of ice movement are conducive to ice stagnation, which is necessary for widespread sedimentation. Ridges of glacigenic sediment show faulted, collapsed margins and lateral kettle holes characteristic of ice-contact landforms. The inter-nal structure of these ridges is analyzed in terms of primary and secondary sedimentary structure and texture. The spatial distribution of sedimentary structure and texture is shown to be similar to fluvial models. The absence of lateral extension of the fluvial members is caused by ice walls preventing lateral migration. Large thicknesses of horizontal stratification and strongly undimodal palaeocurrent estimates are a result of low sinuosity. The distribution of facies is diagnostic of the ice-contact environment. Downstream facies migration is a result of changes in the ratio of sediment supply to stream power. (Knapp-USGS) W72-07968

SIMPLE METRIC SEDIMENTARY STATISTICS USED TO RECOGNIZE DIFFERENT ENVIRON-

MENTS, Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center. A. T. Buller, and J. McManus. Sedimentology, Vol 18, No 1/2, p 1-21, March 1972. 14 fig, 39 ref, append.

*Sediment sorting, *Statistical Descriptors: *Sediment sorting, *Statistical methods, *Particle size, *Sedimentation, Stratistics, Paleohydrology, Regime, Sediment transport, Sampling, Sedimentology. Identifiers: Sedimentary statistics.

Statistical data computed from analyses present-day sediments may be useful for the recognition of ancient environments. Phi-based measures may be used for the separation of sands. An arithmetic technique is suitable for suites of samples with a considerable range of grain sizes. In analyses of approximately 800 samples, quartile and median values were substituted into arithmetic measures of quartile deviation QDa and skewness Ska. Values of QDa were plotted against the median Md on double-log paper for four environments. On each graph the plots indicate a linear trend and both the positions and slopes of the individual trend curves are different. There is a decrease of measures may be used for the separation of sands.

Group 2J-Erosion and Sedimentation

gradient of the curves in the sequence: aeolian-fluviatile-beachequiet water. Values of QDa against Ska were plotted similarly and the gradients of the curves decreased in the reverse sequence. Thus each set of curves (QDa vs Md mm; QDa vs. Ska) establishes a method for comparing and differentiating sediments from these environments. (Knapp-USGS) W72-07969

ERODIBILITY OF SELECTED TROPICAL

SOILS, Agricultural Research Service, Watkinsville, Ga. Soil and Water Conservation Research Div. A. P. Barnett, J. R. Carreker, F. Abruna, and A. E.

Dooley. American Society of Agricultural Engineers Transactions, Vol 14, No 3, p 496-499, May-June 1971. 4 fig, 3 tab, 8 ref.

Descriptors: *Soil erosion, *Puerto Rico, *Tropical regions, Rainfall intensity, Laboratory tests, Slopes, Frequency analysis, Inpact (Rainfall), Soil conservation, Overland flow. Identifiers: *Tropical soils.

Erodibility values were tested for three typical soils in Puerto Rico. Land slopes ranged from 27% to 39%. Rains were applied to dry fallow soil at 2.5 iph for 60 min, then 10 min without rain, followed by 5.0 iph for 60 min. Soil losses/erosion index ratios for slopes 35 ft in length, uncorrected for past cropping and management, were 0.003 for Humatas clay, 0.001 for Juncos clay, and 0.095 for Humatas clay, 0.001 for Juncos clay, and 0.095 for Pandura loam. Standard K values were 0.004, 0.017, and 0.003, respectively. Rainfall intensity-frequency relationships for the three test locations, when related to rainfall and soil loss data for Catalina-Cialitos clay at Mayaquez, showed the relative erosion potential of rainfall to be 1.00, 1.08, and 1.25 for Mayaguez, Corozal-Gurabo and Yabocoa, respectively. On this basis, annual soil losses would be 2.5, 9.2, and 92.6 tons per acre for Humatas clay, Juncos clay, and Pandura loam in the fallow state following removal of sod. The high degree of aggregate stability of these soils renders the energy of raindrop impact of little consequence in the erosion process under normal rainfall conditions. However, storms of hurricane force can cause very severe soil loss. (Knapp-USGS)

BED-MATERIAL CHARACTERISTICS OF AL-

LUVIAL STREAMS, Roorkee Univ. (India). Dept. of Civil Engineering. R. J. Garde.

Sedimentary Geology, Vol 7, No 2, p 127-135, March 1972. 6 fig, 2 tab, 22 ref.

Descriptors: *Sediment sorting, *Bed load, *Alluvial channels, *Particle size, Statistics, Statistical methods, Sediment Sedimentation, Scour, Erosion, Tractive forces.

In the hydraulics of alluvial streams, the nature of the bed material plays a very important role. The bed-material characteristics can be given in terms of the median size d50 and the spread of the material whose index is the standard deviation. For fluvial sediments, the break between suspension and saltation occurred at sediment sizes ranging from 0.075 mm to 0.15 mm; the saltation range was between 0.18 mm and 0.30 mm whereas the bed-load population had size-values greater than 0.50 mm. Other conditions remaining the same, material with greater spread will have a smaller depth of scour than the more uniform material. This is primarily due to formation of a surface layer, of relatively coarse material, on the scour hole which inhibits further scour. Though very few bed-material samples follow a truly log-normal distribution, about 40% of the data show a tendency towards log-normality between 15.9% and 84.1%. The deviations occurring outside this range are, however, significant from the hydraulic point of view, because it is the material in the coarser fractives.

tion that governs phenomena such as armoring. (Knapp-USGS) W72-08189

SHELL DEPOSITS AND SHELL PRESERVA-TION IN QUATERNARY AND TERTIARY ESTUARINE SEDIMENTS IN GEORGIA, U.S.A., Georgia Univ., Sapelo Island. Marine Inst. For primary bibliographic entry see Field 02L. W72-08190

SIZE, GRAIN TYPE AND MINERALOGICAL RELATIONSHIPS IN RECENT MARINE CAL-CAREOUS BEACH SANDS, North Carolina Univ., Chapel Hill. Dept. of Geolo-

D. L. Falls, and D. A. Textoris. Sedimentary Geology, Vol 7, No 2, p 89-102, March 1972. 8 fig, 2 tab, 22 ref.

Descriptors: *Beaches, *Sands, *Mineralogy, *Provenance, *Diagenesis, Carbonates, Particle size, Algae, Statistics, Statistical methods, Florida, Virgin Islands, Bottom sediments, Sediment sorting. Identifiers: Bahamas, Bermuda.

Ten samples of Recent marine carbonate beach sands from the Florida Keys, Bahamas, Virgin Islands and Bermuda were analyzed for sorting parameters, grain genesis, and gross mineralogy. These sands are similar to other beach sands in their tendency toward negative skewness and leptokurtosis. Molluscan fragments are the major grain type in most samples. A decrease in moluscan fragments and an increase in "unknown" material with decreasing size are the only major trends found in grain type. Grain identification was hampered increasingly in the finer classes by recrystallization (or micritization) and infilling of intragranular cavities either by lime mud or crystal growth. Correlation between aragonite content and molluscan fragments is positive. An increase in high-magnesium calcite with decreasing size is due to increase in foraminifers and coralline algae. The influence of the sublittoral biota is great, and tends to homogenize the beach sands even when they are from different parts of a large subtropical geographic area. (Knapp-USGS) W72-08191

RIPPLE AND DUNE PHASES IN A NARROWLY GRADED SAND,

Southampton Univ. (England). Dept. of Civil En-

gineering.
C. J. Pratt, and K. V. H. Smith.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY5, Paper
8912, p 859-874, May 1972. 11 fig, 1 tab, 14 ref, ap-

Descriptors: *Channel morphology, *Sediment transport, *Alluvial channels, *Sand waves, *Ripple marks, Flow resistance, Particle size, Sands, Grading, Regime, Discharge (Water).

Flow resistance and bed-form dimensions were measured over a narrowly graded sand (median diameter 0.49 mm). The purpose of the narrow grading was to accentuate any changes which occur in the transition region between the ripple and dune bed regimes of flow. The test runs were spaced at small intervals of discharge over these flow regimes. There is an unstable region between ripples and dunes where the friction factor falls quite rapidly as discharge increases. Wavelengths corresponding to peaks on the spectral density were compared with the results of other investigators on a dimensionless basis and showed a similar range of values in all cases, despite widely varying experimental conditions. Dune-bed formations exhibit considerable periodicity, whereas ripple bedforms are apparently not periodic, although having a consistent average wavelength. For dune beds there is reasonable agreement between the dune wavelengths (determined by subjective anal-

ysis of a bed profile) and the wavelength (determined from a peak of the spectral density diagram). The correspondence will not necessarily be with the largest peak. Flow depth may be the more significant parameter in determining wavelengths, although width may be important in determining other variations of bed level. (Knapp-USGS) W72-08197

CRITICAL REVIEW OF SEDIMENT TRANS-PORT EXPERIMENTS, Alberta Univ., Edmonton, Dept. of Civil Engineer-

Ing.
R. H. Cooper, A. W. Peterson, and T. Blench.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY5, Paper
8873, p 827-843, May 1972. 8 fig, 2 tab, 28 ref, append.

Descriptors: *Sediment transport, *Laboratory tests, *Hydraulic models, *Flumes, *Reviews, Bed load, Sedimentation, Sedimentology, Model studies, Sand waves, Ripple marks, Data collections.

Empirical formulas dealing with sediment transport and based on limited flume data can result in errors when extrapolated to practical engineering conditions. The available body of experimental data is limited in several areas in comparison to the range of possible field conditions. Many individual collections of data are extremely narrow in scope. Experiments should be conducted for values of average depth of flow divided by the median particle size between 1,000 up to about 100,000. To determine the applicability of such formulas, the available collections of experimental data are examined and recommendations are made for future experimental work. (Knapp-USGS) W72-08199

BED-MATERIAL TRANSPORT AND BED FORMS.

Georgia Inst. of Tech., Atlanta. School of Civil Engineering.

Engineering.
M. R. Carstens, and H. D. Altinbilek.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY5, Paper 8890, p 787-794, May 1972. 3 fig, 1 tab, 3 ref, append.

Descriptors: *Bed load, *Channel morphology, *Sand waves, *Ripple marks, *Sediment transport, Sedimentary structures, Regime, Suspended load, Sedimentation, Traction, Tractive forces, Shear drag, Scour, Erosion, Frou

Because the control of sediment transport is the rate that particles can be removed from the surface of the bed, the geometry of the bed must be a dominant factor in bed-material transport. Bed geometry can be classified by the amplitude of sand waves into three regions-increasing amplitude, decreasing amplitude, and flat bed. Approximate limits between the regions was determined by analysis of sand-wave amplitude, of boundary-drag coefficient, and of sediment-transport rate. Limits between the three regions which define bed geometry are expressed in terms of the sediment number, which is a form of Froude number. Close agreement of the limits of the three regions from the three independent analyses confirms the hypothesis that bed-material transport should be classified by bed-form geometry rather than as suspended load and bed load. (Knapp-USGS)

FRACTIONAL WATER-SEDIMENT SAMPLER, Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.

W. H. Heinemann, and M. J. Brown.
Soil Science Society of America Proceedings, Vol
36, No 2, p 376-377, March-April 1972. 1 fig, 1 tab.

Descriptors: *Sampling, *Sediments, *Suspended load, *Water sampling, Sedimentation, Irrigation water, Return flow, Drainage. Identifiers: Suspended load samplers.

A fractional water-sediment sampler collects large representative samples of water and sediment from streams. Free-fall, such as at drop structures, is required for its operation. The total sediment-laden sample can be split to 50 or 25% of the original sampled flow before being directed to containers. (Knapp-USGS) W72-08216

RADIOACTIVE SEDIMENT TRACER TESTS, CAPE FEAR RIVER, NORTH CAROLINA, Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 05B. W72-08232

THE USE OF RADIOISOTOPES IN SEDIMENT TRANSPORT STUDIES, Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 05B. W72-08234

AN ECONOMIC ANALYSIS OF EROSION AND SEDIMENT CONTROL FOR WATERSHEDS UNDERGOING URBANIZATION, Dow Chemical Co., Midland, Mich. For primary bibliographic entry see Field 05G. W72-0824 Mich.

SYSTEMATIC BEACH PROFILE STUDY OF EASTERN LAKE MICHIGAN (1970-1971), Western Michigan Univ., Kalamazoo. For primary bibliographic entry see Field 02H. W72.08405.

AN INTRODUCTION TO SEDIMENT ANALYSIS, Arizona State Univ., Tempe.

Arizona State Univ., Tempe. C. F. Royse, Jr. Available from Sediment Analysis, 1046 Bluebell Lane, Tempe, Ariz. 85281, Price \$6.50. 1970. 180 p.

Descriptors: *Sedimentology, *Particle size, *Analytical techniques, *Sediment sorting, Sedimentation, Sediment distribution, Aggregates, Sieve analysis, Particle shape, Grading, X-ray analysis, Geology, Soil physical properties, Chemical properties.

Methods described for analyzing sediments include sieve analysis, pipette analysis, hydrometer analysis and X-ray analysis. Related information includes particle-size scales, descriptive measures of size distributions, particle shape, heavy mineral analysis, determination of total reactive carbonate in sediments, determination of oxidizable matter in sediments, determination of calcite-dolomite ratios in carbonate rocks, and determination of calcium and magnesium in carbonate rocks. Many grade scales have been proposed for sedimentary aggregates, each differing from the other in some respect. In theory, each meets a specific need or requirement of the engineer or geologist. A significant difference in grade scales used by engineers is that most are based upon a mesh system. That is, the number of openings per linear unit of sieve surface is used to designate a particular size fraction retained on that screen. U.S. Standard Sieves (approved by the American Society for Testing Materials) are generally used for geological study. (Woodard-USGS)

BARRIER DUNE SYSTEM ALONG THE OUTER BANKS OF NORTH CAROLINA: A REAP-PRAISAL, Virginia Univ., Charlottesville. Dept. of Environ-

Virginia Univ., Charlottesville. Dept. of Environmental Sciences. R. Dolan. Science, Vol 176, No 4032, p 286-288, April 21, 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Barrier islands, *Dune sands, *Soil stabilization, *Beach erosion, North Carolina, Land management, Shore protection, Geomorphology, Ocean waves, Windbreaks, Aeolian soils, Particle size, Wave pile-up, Energy dissipation, Sedimentation, Sediment transport. Identifiers: Barrier dune development.

Barrier dune development has been encouraged for many years by man along the North Carolina Outer Banks to stabilize the barrier islands. The coastal barrier dune system is summarized and reappraised. Originally developed in the 1930's, these dunes were expanded with sand fences and grass plantings in the 1950's to encourage sand accumulation. Unlike a natural beach profile, the beaches have become stabilized and are narrower, steeper, and coarser. The sediment most vulnerable to these changes is the fine materials (0.20 to 0.40 mm) that are the natural supply for nourishment of the native dunes. Major amounts of fine sand are being lost by winnowing to the offshore and by increased attrition in the swash zone. Thus modification of a delicately balanced natural system is leading to severe adjustments in both geological and ecological processes. (Lang-USGS) W72-08412

RIVER DELTA MORPHOLOGY: WAVE CLI-MATE AND THE ROLE OF THE SUBAQUEOUS PROFILE, Louisiana State Univ., Baton Rouge. Coastal Stu-

Louisiana State Univ., Baton Rouge. Coastal Stu dies Inst. For primary bibliographic entry see Field 02L. W72-08413

SOIL LOSS FROM TILE-OUTLET TERRACES, Agricultural Research Service, Ames, Iowa. For primary bibliographic entry see Field 04D. W72-08419

2K. Chemical Processes

THE ADDITION METHOD IN PHOTOMETRY.
II. THE DETERMINATION OF METAL IONS
FROM THE SELF-COLOUR OF THEIR AQUEOUS SOLUTIONS, (IN GERMAN),
Marburg Univ. (West Germany). Chair for
Analytical Chemistry.
For primary bibliographic entry see Field 05A.
W72-07893

METHOD FOR THE DETERMINATION OF TRACES OF MERCURY BY FLAMELESS ATOMIC ABSORPTION, (IN GERMAN), Farbenfabriken Bayer A.G., Dormagen (West Germany), Wissenschaftlisches Laboratorium. For primary bibliographic entry see Field 05A. W72-07894

RADIOCHEMICAL SEPARATIONS WITH HALOGENATED RESINS, Instituto Venezolano de Investigaciones Cientificas, Caracas (Venezuela). Departamento de Tecnologia Nuclear. For primary bibliographic entry see Field 05A. W72-07898

APPLICATIONS OF INFRARED SPECTROSCO-PY IN BIOCHEMISTRY, BIOLOGY, AND MEDICINE, New York Medical Coll., N.Y., Dept. of Biochemistry. For primary bibliographic entry see Field 05A. W72.07900 TESTS FOR SYSTEMATIC ERRORS IN ANAL-YSIS, (IN GERMAN), Badische Anilin- and Soda-Fabrik A.G., Ludwigshafen am Rhein (West Germany). For primary bibliographic entry see Field 07A. W72.07902

ANALYTICAL STUDY OF A CADMIUM ION-SELECTIVE CERAMIC MEMBRANE ELEC-TRODE, Matsushita Electric Industrial Co. Ltd., Osaka (Japan). Wireless Research Lab. For primary bibliographic entry see Field 05A. W72-07904

DESIGN STUDIES FOR A BIOMEDICAL GAS CHROMATOGRAPH, Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research. For primary bibliographic entry see Field 05A. W72.07000

NEW POSSIBILITIES OF ANALYSIS BY COM-BINATION OF DIRECT QUANTITATIVE THIN-LAYER CHROMATOGRAPHY AND ELEC-TRONIC DATA PROCESSING, (IN GERMAN), Schering A.G., Bergkamen (West Germany). Zentrale Analytik Werk Wolfenbuttel. For primary bibliographic entry see Field 05A. W72-07912.

THE CHEMICAL INVESTIGATION OF RECENT LAKE SEDIMENTS FROM WISCONSIN LAKES AND THEIR INTERPRETATION. Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C. W72-07925.

DEUTERIUM CONTENT OF PEAT AS A PALEOCLIMATIC RECORDER,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
W. E. Schiegl.
Science, Vol 175, No 4021, p 512-513, February 4, 1972. 2 fig, 1 tab, 10 ref.

Descriptors: "Paleoclimatology, "Deuterium, "Peat, "Radioactive dating, "Isotope studies, Hydrogen, Radioactivity techniques, Precipitation (Atmospheric), Temperature, Environmental effects, Plant growth, Photosynthesis, Biogeography, Vegetation, Bogs. Identifiers: "Dutch peat bogs, Paleoclimatic recorder:

To check experimentally earlier conclusions that the deuterium content of plants is closely related to climate, the natural deuterium abundance in C14-dated peat samples from different climate periods has been analyzed. The deuterium content of organically bound hydrogen in plants is correlated with that of precipitation. Techniques of the study are described. On the basis of measurements presented in graphs and a table, it is concluded that paleoclimatic information can be derived from the deuterium content of peat. During the transformation of vegetable matter into peat the initial deuterium concentration decreases systematically with increasing carbon content. From this relationship the original deuterium content of the plants that formed the peat in Dutch peat bogs can be derived, and the values obtained can be correlated with pest summer temperatures in the Netherlands. (Lang-USGS).

MINOR ELEMENTS IN ILLINOIS SURFACE WATERS. For primary bibliographic entry see Field 05A. W72-07971

Group 2K—Chemical Processes

DETERMINATION OF TOTAL RARE-EARTH CONTENT IN NATURAL WATERS BY EXTRACTION-SPECTROPHOTOMETRY METHOD (EXCHANGE OF EXPERIENCE), Irkutskii Gosudarstvennyi Universitet (USSR); and Akademiya Nauk URSR, Kiev. Institut Obshchei i Neorganicheskoi Khimii.
For primary bibliographic entry see Field 05A.
W72-07991

MODIFICATIONS OF THE MICROMETHOD OF SAMPLE CLEANUP FOR THIN-LAYER AND GAS CHROMATOGRAPHIC SEPARA-TION AND DETERMINATION OF COMMON ORGANIC PESTICIDE RESIDUES,
Kansas State Univ., Manhattan. Dept. of En-

tomology.

For primary bibliographic entry see Field 05A. W72-08064

CHEMISTRY AND SALINITY OF SOILS IN THE IVOLGA RIVER VALLEY OF THE BURYAT ASSR (KHIMIZM I STEPEN' THE IVOLGA RIVER VALLEY OF THE BU-RYAT ASSR (KHMIZM I STEPEN' ZASOLENIYA POCHV DOLINY R. IVOLGI (BURYATSKAYA ASSR), Akademiya Nauk SSSR, Moscow. Pochvennyy

For primary bibliographic entry see Field 02G.

WATER-RESOURCES APPRAISAL OF THE WHITE PINE COUNTIES, NEVADA,
Geological Survey, Carson City, Nev. For primary bibliographic entry see Field 04B. W72-08092

GRAPHICAL INTERPRETATION OF WATER-

-QUALTIY DATA, Wisconsin Univ., Madison. Dept. of Geology and Geophysics.

A. Zaporozec.

Ground Water, Vol 10, No 2, p 32-43, March-April 1972, 16 fig. 1 tab. 34 ref.

Descriptors: *Water quality, *Data processing, *Graphical analysis, *Data collections, Sampling, Water analysis, Laboratory tests, Geochemistry, Chemical analysis, Analytical techniques, Graphi-

Data concerning the quality of water need to be complied and statistically evaluated. Graphical and numerical interpretation, a basic tool in hydrochemical studies, is one of the means used for summarizing and presenting water-quality data. There exist a considerable number of methods and procedures which can be applied. They are relatively simple and can be used without extensive knowledge of chemistry. Main techniques and methods are grouped into four categories as to their possible use: classification methods, correlation methods, analytic methods, and synthetic and illustrative methods. The basic graphs and diagrams in each category are discussed and examples are given. (Knapp-USGS) W72-08183

FACTORS AFFECTING THE VALIDITY OF CHEMICAL ANALYSES OF NATURAL

New Mexico Inst. of Mining and Technology, Socorro

W. K. Summers.

Ground Water, Vol 10, No 2, p 12-17, March-April 1972. 4 fig, 10 tab.

Descriptors: *Water analysis, *Chemical analysis, *Laboratory tests, Calibrations, Analytical techniques, Statistics, Statistical methods, Measurement, Sampling.
Identifiers: Error analysis. Chemical analyses of natural water may be inadequate because of inadvertent human errors and adequate because of inadvertent numan errors and sample aging. Characteristic deficiencies can be demonstrated by multiple chemical analyses of the same sample by different laboratories, multiple analyses of the same sample by one laboratory, repeated analyses of one sample as a function of peated analyses of one sample as a function of time, and a simple laboratory experiment in rock-water chemistry. Whenever possible, complete chemical analyses should be made. The most relia-ble analyses are those in which combining weights of the cation equal the combining weight of the anion and in which the sum of the individually measured constituents equals the observed residue on evaporation at 180 deg C (total dissolved solids). (Knapp-USGS)

RETENTION OF BORON BY TRAVERTINES, Tokyo Metropolitan Univ., (Japan). Faculty of

M. Ichikuni, and K. Kikuchi. Chemical Geology, Vol 9, No 1, p 13-21, March 1972. 1 fig, 2 tab, 24 ref.

Descriptors: *Adsorption, *Calcium carbonate, *Boron, *Springs, *Travertine, Water chemistry, Groundwater, Limestones.

The boron content of travertines can be related to the boron concentration in the travertine-depositing thermal waters in terms of the Freundlich adsorption isotherm. Travertines deposited from thermal waters are especially interesting for the purpose of this study, being in most cases free from boron-adsorbing impurities, such as clayey substances and hydrous ferric oxide. The boron is mostly incorporated into the carbonate phase. Ad-sorption is affected by many factors, such as temperature, salt concentration, dissolved state of species adsorbed, and surface properties of adsorbent. Apparently some of these are different from one travertine to another. The rate of precipitation of travertines also plays an important part in the uptake of boron. (Knapp-USGS) W72-08188

SOLUBILITY AND SOLUBILITY PRODUCT OF GYPSUM IN SOIL SOLUTIONS AND OTHER AQUEOUS SOLUTIONS, Alburn Univ., Alabama. Dept. of Agronomy and

For primary bibliographic entry see Field 02G.

SWELLING PRESSURES, ELECTRIC POTEN-TIALS, AND ION CONCENTRATIONS: THEIR ROLE IN HYDRAULIC AND OSMOTIC FLOW THROUGH CLAYS,
Agricultural Research Service, Beltsville, Md.

For primary bibliographic entry see Field 02G. W72-08214

ANALYTICAL METHODS IN OCEAN RAPHY. I. INORGANIC METHODS, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05A. W72-08239

LIMNOLOGICAL DATA FROM LAKE ST. CLAIR, 1963 AND 1965, National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.

For primary bibliographic entry see Field 02H. W72-08415

WELL AND GROUND-WATER CHEMICAL ANALYSIS DATA, GLASSCOCK COUNTY, TEXAS,

Texas Water Development Board, Austin primary bibliographic entry see Field 04B. CONDUCTIMETRIC DETERMINATION OF CONDUCTIMETRIC DETERMINATION OF ACTIVITY COEFFICIENTS: ALKALI METAL NITRATES, BROMATES, AND IODATES IN WATER AT 25 DEG. C. (DETERMINATION CONDUCTIMETRIQUE DES COEFFICIENTS D'ACTIVITE: SELS ALCALINS A ANIONS OX-YGEN ES DANS L'EAU A 25 DEG C, Paris Univ. (France). Laboratoire

trochimie. M. C. Justice, R. Bury, and J. C. Justice. Electrochimica Acta, Vol 16, No 6, p 687-700, June 1971. 8 tab, 21 ref. English summary.

Descriptors: *Ionization, *Alkali metals, *Aqueous solutions, *Electrolysis, *Conductivity, Mathematical studies, Equations, Water temperature, Nitrates, Analytical techniques. Identifiers: Activity coefficient, Iodates, Chlorates, Ionic association.

The conductances of nitrates, bromates and iodates of alkali metals were measured in aqueous solutions at 25 deg. C. For these systems, ionic association was established and the association constants were determined by use of the Fuoss-Onsager equation. These results, together with those of chlorates and perchlorates of alkali metals formerly studied, were used to calculate the activity coefficient from the Debye-Huckel relation as generalized by Bjerrum for the case of association. Comparison with available experimental results shows that the use of conductance data to determine activity coefficients is justified for dilute solutions where the ionic strength is less than 0.1 M. (Woodard-USGS)

ON WATER, VOL. XXXVII. AN ANNUAL FOR WATER CHEMISTRY AND WATER PURIFICA-TION TECHNIQUE, (IN GERMAN), For primary bibliographic entry see Field 05A. W72-08483

2L. Estuaries

THE ECOLOGY OF THE PLANKTON OFF LA JOLLA, CALIFORNIA, IN THE PERIOD APRIL THROUGH SEPTEMBER, 1967. California Univ., Berkeley. For primary bibliographic entry see Field 05C.

COEXISTENCE OF SPECIES OF ACARTIIDAE (COPEPODA) IN THE COCHIN BACKWATER, A MONSOONAL ESTUARINE LAGOON. Indian Ocean Biological Centre, Cochin, (India). For primary bibliographic entry see Field 05C. W72-07939

SEDIMENTS AND HISTORY OF THE POST-GLACIAL TRANSGRESSION IN THE PERSIAN GULF AND NORTHWEST GULF OF OMAN, Kiel Univ. (West Germany). Geological-Paleontological Inst. For primary bibliographic entry see Field 02J. W72-07957

W72-07963

BEACH STRUCTURES PRODUCED BY CRAR PELLETS. Indian Inst. of Tech., Kharagpur. Dept. of Geology and Geophysics. For primary bibliographic entry see Field 02J.

LINEAR SAND BANKS IN THE SOUTHERN

NORTH SEA, British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Center. For primary bibliographic entry see Field 02J. W72-07967

Estuaries—Group 2L

A PRACTICAL METHOD OF DETERMINING WATER CURRENT VELOCITIES AND DIFFUSION COEFFICIENTS IN COASTAL WATERS BY REMOTE SENSING TECHNIQUES, Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-07970

AUTOMATED DELINEATION OF WETLANDS IN PHOTOGRAPHIC REMOTE SENSING, Gruman Aerospace Corp., Bethpage, N.Y. Research Dept. For primary bibliographic entry see Field 07C. W72-07974

MATHEMATICAL PROGRAMMING FOR RE-GIONAL WATER QUALITY MANAGEMENT, California Univ., Los Angeles. School of Busi-

For primary bibliographic entry see Field 05G. W72-07998

ATLANTIC COAST OF LONG ISLAND, FIRE ISLAND INLET AND SHORE WESTERLY TO JONES INLET, NEW YORK, BEACH EROSION CONTROL AND NAVIGATION PROJECT, AT-LANTIC OCEAN AND GREAT SOUTH BAY, NEW YORK (FINAL ENVIRONMENTAL IM-PACT STATEMENT).

Army Engineer District, New York.
For primary bibliographic entry see Field 08A.
W72-08001

ATLANTIC HARBOR OF REFUGE, CARTERET COUNTY, NORTH CAROLINA-NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATE-

Army Engineer District, Wilmington, N. C. For primary bibliographic entry see Field 08D. W72-08015

OCEAN POLITICS AT THE UNITED NATIONS, Department of the Interior, Washington, D.C. For primary bibliographic entry see Field 06E.

EFFECTS OF TEMPERATURE AND SALINITY ON GROWTH, FOOD CONVERSION, SUR-VIVAL AND TEMPERATURE RESISTANCE OF

VIVAL AND TEMPERATURE RESISTANCE OF JUVENILE BLUE CRABS, CALLINECTES SAPIDUS RATHBUN,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
J. S. Holland, D. V. Aldrich, and Kirk Strawn.
Available from the National Technical Information Service as COM-71-01036, \$3.00 in paper copy, \$0.95 in microfiche. Sea Grant Program Publication TAMU-SG-71-222, 1971. 166 p, 36 fig, 32 tab, 83 ref. NOAA Sea Grant GH-101.

Descriptors: *Crabs, *Temperature, *Salinity, *Resistance, *Juvenile growth stage, Mortality, Ecology, Growth rates, Mathematical studies, Weight, Productivity, Estuaries, Nutrient requirements, Foods, Aquiculture.

Identifiers: *Food conversion, *Survival, Cal-linectes sapidus, Cannibalism, Substrate, Molting, Lethal temperature limit, Mariculture.

Information was sought vital to commercial culture of the blue crab on the Texas Gulf Coast. The maximum temperature for juvenile crab growth in laboratory tanks was 29-30C. Salinity within the range of 2-21 has little effect on growth or mortalized for the commercial blue crabbs. Salinity at 1 or less was trange of 2-21 has title elect on grown of mortant vof juveniles in water at 29C in the laboratory. This lethality is related to molting of the crab. They accepted and grew on pelleted artificial feeds. Survival of uncaged blue crabs was enhanced by a sand plus oyster shell substrate; sand or glass substrate did not prevent cannibalism, which remains a major impediment to crab

culture. Acclimation to a change of 8C seems to require 4 days, a rate of about 2 C-per day. The 1000 minute median lethal temperatures for crabs acclimated to 20, 25 and 30C were 37.1, 38.6 and 39.4C, respectively. The 45-day thermal tolerance of small blue crabs is high with the upper incipient lethal temperature being around 33 C if deaths in this study were directly attributable to temperature. (See also W72-08046) (Jones-Wisconsin) W72-08045

ECOLOGICAL ASPECTS OF SELECTED CRUSTACEA OF TWO MARSH EMBAYMENTS OF THE TEXAS COAST, Texas A and M Univ., College Station. Dept. of Biology and Agricultural Extension Service. Fred S. Conte, and Jack C. Parker.

Fred S. Conte, and Jack C. Parker. Available from the National Technical Informa-tion Service as COM-71-00963, \$3.00 in paper copy, \$0.95 in microfiche. Sea Grant Publication No TAMU-SG-71-211, June 1971. 184 p, 42 fig, 32 tab, 111 ref. NOAA Sea Grant GH-101.

Descriptors: *Shrimp, *Pesticide toxicity, *Bays, *Marshes, Crustaceans, Water pollution effects, Texas, Temperature, Salinity, Mosquitoes, Gaschromatography, Ecology, Tidal effects, Size, Foods, Fisheries, Insecticides, Mathematical stu-

dies.

Identifiers: "Malathion, "Penaeid shrimp, Grass shrimp, Sergestid shrimp, Mysid shrimp, Lengthweight analysis, West Bay (Texas).

Commercial penaeid shrimp, grass shrimp (Palaemonetes), sergestid shrimp, and mysid shrimp were collected from two marsh embay-ments, Oyster and Alligator Lakes near West Bay, Texas, twice a month for two years, identified, and their seasonal abundance determined relative and their seasonal adultidate determine treative to temperature and salinity. Effects of aerial appli-cation of malathion in mosquito control concentra-tions on the juvenile commercial shrimp Penaeus aztecus and P setiferus were studied. Commercial aztecus and P setiferus were studied. Commercial shrimp suffered mortalities (14-80%) while the controls suffered no pesticide deaths. Water analysis demonstrated high malathion concentration immediately after application. P aztecus possesses a faster and, usually, greater sensitivity to malathion than P setiferus. The condition and length-weight relationship of P aztecus and P setiferus varied greatly, the cause of the variation was unknown. In both lake complexes condition of P aztecus decreased with increasing salinity. Con-P aztecus decreased with increasing salinity. Condition of P setiferus in Oyster Lake complex, decreased with decreasing temperature and salinity. In Alligator Lake complex, condition of P setiferus increased with increasing temperature and salinity. This contradiction is either inexplicable or indicates that other factors, such as food, are more significant. (See also W72-08045) (Jones-Wisconsin) W72-08046

SOIL SALINITY EFFECTS ON ABSORPTION OF NITROGEN, PHOSPHORUS, AND PROTEIN SYNTHESIS BY COASTAL BERMUDAGRASS, Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 02G. W72-08138

DISTRIBUTIONAL PATTERNS IN ASSEM-BLAGES OF ATTACHED DIATOMS FROM YAQUINA ESTUARY, OREGON, Oregon State Univ., Corvallis. Dept. of Botany; and Oregon State Univ., Corvallis. Dept. of For primary bibliographic entry see Field 05B. W72-08141 Statistics.

SHELL DEPOSITS AND SHELL PRESERVA-TION IN QUATERNARY AND TERTIARY ESTUARINE SEDIMENTS IN GEORGIA, U.S.A., Georgia Univ., Sapelo Island. Marine Inst. H. U. Wiedemann.

Sedimentary Geology, Vol 7, No 2, p 103-125, March 1972. 5 fig, 2 plate, 3 tab, 43 ref.

Descriptors: *Sediments, *Estuaries, *Georgia, *Diagenesis, Tides, Sedimentation, Water chemistry, Leaching, Weathering, Calcite, Carbonates, Erosion, Sedimentary structures, Stratigraphy, Mineralogy, Marshes, Tidal marshes.

The present-day salt-marsh estuaries of Georgia are shallow-water bodies having expanses of intertidal realms as the result of a relatively large tidal range of 2 m. Processes of sedimentation dominate over erosional processes in the estuaries. Detrital sand, silt and clay, together with organic debris and skeletal carbonates, contribute to the accumulations. Destruction of shell remains is promoted by marine borers, particularly Cliona, and by chemical leaching. Especially in tidal-marsh soils shells are subject to dissolution unless they are buried rapidly. In a marsh sediment calcitic concretions were formed around severely leached shell ried rapidly. In a marsh sediment calcitic concretions were formed around severely leached shell remains. Where shells within a reduced sediment are leached, the local rise in pH often promotes precipitation of pyrite. Once included in fine-grained sediments, however, shells have a good chance of becoming preserved, especially if they are thick and consist of calcite rather than aragonite. Oyster shells are thus particularly durable. Because of their local abundance, oysters yield sizable shell deposits, including reefs, reworked deposits, and cheniers. Reworked accumulations of considerable extent occur in intermulations of considerable extent occur in inter-tidal and shallow subtidal realms, usually in the vicinity of major tidal inlets. The accumulations, vicinity of major tidal inlets. The accumulations, which form lenticular bodies of varying lateral extent, are interbedded with detrital sediments. The matrix of the shell concentrates is generally muddy, but can also be sandy or conglomeratic. Oyster beds of Late Pleistocene and mid-Tertiary ages in Georgia are similar to the recent ones. (Knapp-USGS) W72-08190

BIOLOGY OF MICROGOBIUS THALASSINUS (PISCES: GOBIIDAE), A SPONGE-INHABITING GOBY OF CHESAPEAKE BAY WITH RANGE EXTENSIONS OF TWO GOBY ASSOCIATES, North Carolina Univ., Morehead City. Inst. of Marine Sciences.

Manne Sciences.
Frank J. Schwartz.
Chesapeake Sci. 12 (3): 156-166. 1971. Maps.
Identifiers: Bay, Biology, Chesapeake, Gobiidae,
Gobiosoma-Robustum, Goby, MicrocionaProlifera, Microgobius-Gulosus,
Thalassinus, Pisces, Range, Sponge.

M. thalassinus remained an obscure species until it was discovered that it is another goby that often associates with sponges. By season and depth, Microciona prolifera was found to be the selected habitat in the Patuxent River (Green Holly Bar), natural in the returner River (Green Holy Bar), adjacent Chesapeake Bay, and seaside mud-oyster habitats. Past and present distributions are com-pared with the 141 specimens that were collected between 1958 and 1968. Additional comments are presented on body morphology and meristics, color, aquarium observations, food, behavior, growth, larvae, gonad condition, and associated species. The ranges of Microgobius gulosus and Gobiosoma robustum are extended to the Patuxent River, Maryland .-- Copyright 1972, Biological Abstracts, Inc. W72-08249

DISTRIBUTION OF THE FIDDLER CRAB (UCA MINAX) IN RELATION TO MARSH PLANTS WITHIN A VIRGINIA ESTUARY, Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.

Chesapeake Sci. 12 (3): 180-183. 1971. Illus. Identifiers: Crab, Distichlis-Spicata-M, Distribution, Estuary, Marsh, Plants, Relation, Scirpus-Robustus-M, Spartina-Alterniflora-M, Spartina-Cynosuroides-M, Spartina-Patens-M, UCA-Minax, Virginia.

Group 2L—Estuaries

The distribution and abundance of the U. minax, was related to the distribution of marsh plants within a Virginia estuary. The crab was found in association with 15 spp. of marsh phanerogam occurring with 5 plant species more than 20% of the time. These plants were Spartina alterniflora, Scirpus robustus, Distichlis spicata, Spartina patens, and Spartina cynosuroides. Densities ranged from 0.76 burrows/m2, mean densities being 7.88 within the brackish-water marsh and 14.35 within the salt-water marsh. The crab was not obtained by sampling the freshwater marsh.--Copyright 1972, Biological Abstracts, Inc. W72-08251

THE USE OF WATER-QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THERMAL EFFECTS PROBLEM, RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 05B. W72-08257

MATHEMATICAL MODELING OF ESTUARI-

AL SYSTEMS, California Univ., Davis. Dept. of Civil Engineer-

For primary bibliographic entry see Field 06A. W72-08264

MATHEMATICAL MODEL APPLICATIONS FOR WATER QUALITY MANAGEMENT IN THE POTOMAC ESTUARY,

Environmental Protection Agency, Seattle, Wash. Region X. For primary bibliographic entry see Field 06A. W72-08265

MODELLING TECHNIQUES FOR SITING LARGE THERMAL POWER PLANTS ON IN-DUSTRIALIZED ESTUARIES

Clemson Univ., Clemson, S.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.

W72-08266

BARRIER DUNE SYSTEM ALONG THE OUTER BANKS OF NORTH CAROLINA: A REAP-PRAISAL, Virginia Univ., Charlottesville. Dept. of Environ-

mental Sciences.
For primary bibliographic entry see Field 02J.
W72-08412

RIVER DELTA MORPHOLOGY: WAVE CLI-MATE AND THE ROLE OF THE SUBAQUEOUS PROFILE.

Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

L. D. Wright, and J. M. Coleman. Science, Vol 176, No 4032, p 282-284, April 21, 1972. 1 fig, 2 tab, 7 ref.

Descriptors: *Deltas, *Ocean waves, *River flow, *Sediment distribution, *Geomorphology, Land forming, Coasts, Beaches, Continental shelf, Mis-Sediment load, Fluid friction.

Identifiers: River mouth configuration, Process

environment, Wave power, Subaqueous slope.

procedure is developed for analyzing the discharge and wave-power climates of delta coasts from published data, maps, and aerial photographs. Application of a comprehensive wave climate program to seven major deltas indicates that deltaic configurations and coastal landform comto the configurations and coastal fandrom com-binations depend largely on the ability of the river to supply sediments relative to the ability of waves to rework and redistribute the sediments. Nearshore wave power is not correlative with deepwater wave power but, owing to frictional attenuation, is a function of the subaqueous slope. The subaqueous slope, in turn, depends partially on the slope and width of the continental shelf but

primarily on the rate at which river discharge can supply sediments to the nearshore belt. River-dominated configurations result only when the river is able to build flat offshore profiles, which reduce nearshore wave power. Where the subaqueous slope is steep, waves reach the shore nearly undiminished and wave-built forms prevail. (Lang-USGS) W72-08413

COMMERCIAL FISHERY AND BIOLOGY OF THE FRESHWATER SHRIMP. MACROBRACHIUM IN THE LOWER ST. PAUL RIVER, LIBERIA, 1952-53, National Marine Fisheries Service, Miami, Fla.

Tropical Atlantic Biological Lab.
For primary bibliographic entry see Field 08I.
W72-08445

THE SHRIMP LEPTALPHEUS FORCEPS IN OLD TAMPA BAY, FLORIDA, Bureau of Commercial Fisheries, St. Petersburg

Beach, Fla. Biological Lab. Carl H. Saloman

Ouart J Fl Acad Sci. 34 (1): 67-77. 1971. Illus. Map. Identifiers: Bay, Florida, Leptalpheus-Forceps, Record, Shrimp, Tampa, Upogebia-Affinis.

Collection of alpheid shrimp, L. forceps Williams, in Old Tampa Bay, Florida, marks the first record of the species outside the type locality, Beaufort, North Carolina. Ecological conditions of the habitat are described. These features include sedi-ment type and hydrology within the borrows and from surrounding water. Association of the shrimp with the macruran crustacean, Upogebia affinis, is mentioned along with its abundance, size, and reproductive state.--Copyright 1972, Biological Abstracts, Inc. W72-08457

THE NUTRITION OF FISHES IN ESTUARINE WATERS OF THE STATE OF CEARA, (IN POR-TUGUESE), Ceara Univ., Fortaleza (Brazil). Laboratorio de

Cienceias Marinha. Edna Furtado.

Arq Cienc Mar. 9 (2): 111-114, 1969. English sum-

mary. Identifiers: Algae, Brazil, Ceara, Crustacea, Diapterus-olisthostomus, Estuarine, Eugerres-brasilianus, Fishes, Gobionellus-oceanicus, Inver-tebrates, Nutrition, Xenomelaniris-brasiliensis.

The crustacean, other invertebrates and algae food Gobionellus oceanicus, Xenomelaniris brasiliensis, Diapterus olisthostomus and Eugerres brasilianus are qualitatively and quantitatively measured.--Copyright 1972, Biological Abstracts, Inc. W72-08481

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INFRASONIC ACTIVATION OF DESALINA-TION MEMBRANES, Walter Huff

U. S. Patent No 3,491,022, 3 p, 4 ref; Patent Abstracts Section, Official Gazette, Vol 870, No 3, p 961, January 20, 1970.

Descriptors: *Parents, *Desalination processes, Membranes, *Demineralization, *Reverse osmosis, *Sound waves, *Semipermeable membranes, Water purification, *Separation techniques, *Waste water treatment, Water quality control. Identifiers: *Infrasonic activation, Low frequency

A method is provided for producing compression and rarefactions at the surface of a semipermeable membrane being used in demineralization of saline waters. Low frequency vibrational energy in the range 1 to 5000 cycles per second is applied to the salt water cell and to the interface between the membrane and salt water. This causes fresh water to flow from the salt water cell through the membrane at greater rates than where no infrasound is used. The turbulence and friction at the interface minimize the tendency of the membrane to become clogged with salt. (Sinha-OEIS) W72-07983

REVERSE OSMOSIS APPARATUS.

Desalination Systems, Inc., San Diego, Calif. (Assignee). Donald T. Bray.

U. S. Patent No 3,504,796, 4 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 873, No 1, p 125, April 7, 1970.

Descriptors: *Patents, *Reverse Osmosis, Membranes, Water purification, Water treatment, Membrane processes, *Separation techniques, *Waste water treatment, *Liquid wastes, Water quality control.

A membrane module and a flow regulator are designed to fit and operate inside a common tubular casing. The casing may contain a feed water filter and product water treatment material. A safety valve may be included for protection in the case of membrane rupture. Flow control is accomplished by passing the concentrated solution through a conduit formed by the grooved face of a plug in contact with an adjoining system element. (Sinha-OEIS) W72-07986

METHOD OF TREATMENT OF LIQUIDS BY REVERSE OSMOSIS, Desalination Systems, Inc., Escondido, Calif. (As-

Donald T. Bray

U. S. Patent No. 3,505,215, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 873, No. 1, p. 217, April 7, 1970.

Descriptors: *Patents, *Reverse osmosis, *Semipermeable membranes, *Filters, Separation techniques, Water treatment, *Desalination processes, Membranes, *Waste water treatment, Water purification, Water quality control, *Liquid

The liquid to be treated is passed through a filter which has openings of effective diameter less than the hydraulic diameter of the channels in the membrane. After passing through the membrane the liquid passes through a second filter which has smaller openings than the membrane. Periodically the direction of the flowing liquid is reversed. The back flashing action back-washes and cleans the filter that has previously collected debris or particulate matter. Systematic flow reversal is accomplished by a four-way valve activated by a timing device. (Sinha-OEIS) W72-07989

ANALYSIS OF THE FEASIBILITY OF INTERIM WATER SUPPLIES, California Univ., Riverside. Dept. of Soil Science

and Agricultural Engineering. For primary bibliographic entry see Field 06B. W72-07999

DISTILLATION APPARATUS WITH SPRAY CHAMBER AND AIR CIRCULATING MEANS, A. R. Dismore

N. B. Dismore.
U. S. Patent No. 3,522,151, 3 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office Vol. 876, No. 4, p 946, July 28, 1970.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Saline Water Conversion—Group 3A

Descriptors: *Patents, *Distillation, Sea water, *Desalination, Water purification, Water treatment, *Evaporation, *Condensation, Separation techniques, Heat exchangers.

Liquid is heated and fed to a first stage spray. It is sprayed downward in the evaporating chambers where it mixes with warm air, saturating the air. During passage of the warm air it becomes completely saturated for conveyance to the condensing chamber. Condensation takes place in heat exchange relationship with the evaporating side of the heat exchanger. (Sinha-OEIS) W72-08164

DESALINATION OF SALINE WATER BY PHASE SEPARATION NEAR CRITICAL PRES-

SURE OF PURE WATER, Hydro Chemical and Mineral Corp., New York. (Assignee). A. Osdor.

U. S. Patent No. 3,522,152, 18 p, 9 fig, 3 tab, 8 ref; Official Gazette of the United States Patent Office Vol. 876, No. 4, p. 946, July 28, 1970.

*Patents, *Desalination, Descriptors: *Descriptors: Fatents, Desannation,
*Demineralization, Sea water, *Water purifica-tion, *Separation techniques, Water treatment, Desalination process, Desalination apparatus, Heat exchangers. Identifiers: *Phase separation.

Desalination or demineralization is achieved by effecting phase separation in the vicinity of the criti-cal pressure of pure water and in addition compressing the pure water vapor and using the water vapor to heat raw saline water by countercurrent heat exchange. Intermediate fluids such as nitrogen (gas) are compressed while at a lower temperature and then expanded at a higher temperature to generate an excess of work which is then available for use in driving the fluids. Hydraulic pressure-exchanging devices are pro-vided for driving, pumping or exchanging pres-sures between different fluids. (Sinha-OEIS)

VACUUM FLASH DISTILLING APPARATUS,

VACUUM FLAGAR PLAGAR CC. W. Galuska.
U. S. Patent No. 3,522,150, 3 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office Vol. 876, No. 4, p. 945, July 28, 1970.

Descriptors: *Patents, *Evaporation, Heat exchangers, Distillation, Saline water, Evaporators, *Water treatment, Separation techniques, Equipment, *Desalination. Identifiers: Vacuum pumps.

Salt water is partially evaporated by heat exchange with the water cooling system of an internal com-bustion engine within an evaporator. The engine drives a vacuum pump to operate the flash-type separator to which the partially evaporated salt water is connected. Distillate is collected from the liquid outlet of the separator and from a condenser which the vapor outlet is connected. (Sinha-OEIS) W72-08167

DISTILLATION APPARATUS TO RECOVER POTABLE WATER FROM NON-POTABLE WATER,

For primary bibliographic entry see Field 05F. W72-08168

DESALINATION USING AN N-3-OXOHYDROC-ACRYLAMIDE ARBON-SUBSTITUTED POLVMER MEMBRANE

Lubrizol Corp., Wickliffe, Ohio. (Assignee). D. I. Hoke.

U. S. Patent No. 3,520,804, 11 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office Vol. 876, No. 3, p. 604, July 21, 1970. Descriptors: *Patents, *Desalination, *Membranes, Filtration, *Polymers, Separation techniques, Water purification, Water treatment.

A method is described for removing dissolved impurities from water by passing the water into a vessel bounded at least partially by a semi-permeable membrane. The membrane comprises a a homopolymer or interpolymer of an N-3-ox-ohydrocarbon-substituted acrylamide. Water is desalinated as it is forced through the membrane. While the total salt rejection is lower than by use of cellulose acetate, water flux increases markedly and it becomes feasible to connect several desalination units in series and accomplish the desalination in less time than is required with a single cellulose acetate membrane. (Sinha-OEIS) W72-08171

MODULAR UNIT FOR MULTISTAGE FLASH DISTILLATION,
American Machine and Foundry Co., New York.

(Assignee). W. R. Williamson.

U. S. Patent No. 3,513,075, 3 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office Vol. 874, No. 3, p. 911, May 19, 1970.

Descriptors: *Patents, *Flash distillation, Equipment, Sea water, Desalination apparatus, Separation techniques, Water purification, Water treatment, *Desalination plant, Treatment facilities.

The modular unit comprises an outer shell of low cost structural material partitioned to establish upper flash chambers connected to lower condenser chambers by vapor ducts. The operating pressure loads are absorbed by the outer shell. The loading stresses imposed by negative pressure may be absorbed by low cost structural material. Only those portions in contact with corrosive feed solutions are formed by relatively high cost corrosion resisting materials. (Sinha-OEIS)

FLASH EVAPORATION WITH SERIES AR-RANGED WITH SOLAR HEATING ZONE, S. A. Guerrieri.

U. S. Patent No. 3,511,756, 4 p, 3 fig, 15 ref; Official Gazette of the United States Patent Office Vol. 874, No. 2, p. 584, May 12, 1970.

Descriptors: *Patents, *Flash distillation, Potable water, *Solar distillation, Separation techniques, *Evaporation, Water treatment, Water purifica-*Condensation, Saline water, Brackish Identifiers: Solar heat.

Saline or brackish water is heated in a solar heater without change of phase and then flashed in below atmospheric pressure stages of decreasing temperature and pressure. The flashed vapors are condensed and recovered as potable water. The system may be adapted to a twenty-four hour operation by storing water during the sunny hours and using it as feed for the flash stages during nonsunny hours. (Sinha-OEIS) W72-08182

FURTHER STUDIES OF THE OPTIMUM OPERATION OF DESALTING PLANTS AS A SUPPLEMENTAL SOURCE OF FIRM YIELD, Utah State Univ., Logan. Coll. of Engineering. C. G. Clyde, and W. H. Blood. Final report, May 1971. 134 p, 25 fig, 15 tab.

Descriptors: *Desalinization plants, *Water supply, *Operations research, Hydrology, Simula-tion, Mathematical models, *Model studies, New York, Optimization, *Optimum development

Identifiers: *Operating rule program, *New York

An earlier report by Clyde and Blood (See W70-07378 and W70-07865) developed an Operating Rule Program (ORP) to furnish a means to determine optimum desalting plant size, an economically optimal operating-time rule, and costs of operating in conjunction with existing water supply systems: The plant would act as a supplementary water supply to already existing sources. supply systems: The plant would act as a supplementary water supply to already existing sources. The present study is a continuation of the above, and it accomplishes five further objectives: (1) To modify the ORP (MORP) so it can analyze stage construction of the desalting plant; (2) and (3) to apply MORP to analyze the desalting alternative in two systems--New York City (dual purpose nuclear power MSF/VTE plant) and Norfolk City (single purpose MSF plant); (4) to prepare a separate version of the OPR suitable for analyzing the desalting alternative for water systems without the desalting alternative for water systems without reservoir storage; and (5) to conduct a training seminar to teach utilization of MORP. The ORP seminar to teach utilization of MORF. The ORF models utilize modern operational hydrology cou-pled with digital simulation of the water system. It is considered that the desalting plant should operate intermittently to supply water only when natural supplies are insufficient, thus adding to the system an additional quantity of firm and reliable eld. (Bell-Cornell)

COLLAGEN MEMBRANES FOR REVERSE OS-MOSIS DESALINATION.

S. Higley.
U. S. Patent No. 3,644,202, 3 p, 1 tab, 11 ref; Official Gazette of the United States Patent Office Vol. 895, No. 4, p. 1458, February 22, 1972.

Descriptors: "Patents, "Desalination, "Reverse osmosis, "Membranes, Brackish water, Separation techniques, Ions. Identifiers: "Collagen membranes.

A process is presented for desalination of brackish water containing substantial amounts of magnesium or calcium ions by reverse osmosis. It involves contacting the brackish water under pressure in excess of the osmotic pressure of the magnesium or calcium ions in solution with a membrane consisting of collagen in a mixture of water and organic solvent, and casting to form a film. Cross-linking is effected by means of heat treatment at 110 degrees to 150 degrees C. A cross-linking agent is included in the dispersion used to form the col-lagen film. (Sinha-OEIS) W72-08274

TREATMENT OF SEWAGE AND OTHER CON-TAMINATED LIQUIDS WITH RECOVERY OF WATER BY DISTILLATION AND OXIDATION, Anti-Pollution Systems, Inc., Pleasantville, N. J. (Assignee). For primary bibliographic entry see Field 05D. W72-08276

MULTISTAGE VAPOR-LIQUID CONTACT PROCESS FOR PRODUCING FRESH WATER FROM SALT WATER,

C. S. Smith, Jr.
U. S. Patent No. 3,640,850, 6 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office Vol. 895, No. 2, p. 621, February 8, 1972.

Descriptors: *Patents, *Desalination, *Distillation, Condensation, Separation techniques, *Heat exchange, Heat transfer.

Heat exchange is effected by direct contact between an aqueous phase and a non aqueous phase which is lower boiling than water and is immisable with water. The nonaqueous phase has a different density than water. It will either float on top of a body of water or will sink beneath the water causing the water to float on top. This facilitates separation of the two phases by gravity. Heated water is caused to distill to provide fresh water vapor. Cooled fresh water is contacted with water vapor to condense the water vapor. A por-

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

tion of the resulting fresh water is withdrawn as product, the remainder is recycled. (Sinha-OEIS) W72-08282

DESALINATION PROCESS, Bresler and Associates Inc., New York. (As-S. A. Bresler.

Official Gazette of the United States Patent Office Vol. 8. Po. 1, p. 251, February 1, 1972.

Descriptors: *Patents, *Desalination processes, *Ion exchange, *Reverse osmosis, *Desalination, Brackish water, Separation techniques.

Inorganic salts can be removed from an aqueous solution, particularly a brackish water, by contacting the solution with one or more ion exchange resins. The resulting solution can then be forced through a reverse osmosis membrane which rejects salts; yielding an inorganic salt and a solution having a substantially lower inorganic salt content. Examples of tests with acid resin in the sodium form, and the acid resin Amberlite are given. The chloride and sulfate ion values can be materially reduced to maintain a 50 per cent product recovery (Sinha-OEIS) W72-08284

DESALINATION DISTILLATION USING BARIUM CARBONATE AS DESCALING AGENT, Orca, Inc., Cambridge, Mass. (Assignee).

A. M. Gaudin U. S. Patent No. 3,525,675, 3 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office Vol

877, No 4, p 878, August 25, 1970.

Descriptors: *Patents, *Desalination, Sea water, *Descaling, Precipitation, Fresh water, *Distillation, Separation techniques. Identifiers: *Barium carbonate.

Barium carbonate is used as a cyclic descaling agent and regenerated in a descaling and distilling process to produce fresh water from sea water. It is admixed with sea water to form barium sulfate, calcium carbonate, and magnesium carbonate which are removed as precipitates. The descaled sea water is then distilled in a conventional apparatus. By-products of commercial value are sulfur, magnesia, useful gases, and regenerated bari-um carbonate. (Sinha-OEIS) W72-08289

Congress, Washington, D.C.; and House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-08346

SPECIAL STUDIES ON THE CHARAC-TERISTICS OF A FLASHING STAGE, AMF Cuno Div., Waterford, Conn. W. R. Williamson, and J. R. Heffer. For sale by the Superintendent of Documents, U.

S. Government Printing Office, Washington, D. C. 20402. Price \$1.25. Office of Saline Water Research and Development Progress Report No 575, May 1970. 167 p, 37 fig, 3 ref, 4 append. OSW Contract 14-01-0001-2177.

Descriptors: *Saline water conversion, *Desalination plants, *Evaporators, *Distillation, *Flash distillation.

Identifiers: *Multi-stage flash evaporator process, Mist separators.

The purpose of this study was to evaluate different methods for controlling non-equilibrium in flash evaporators. Also studied was an improved formula for predicting non-equilibrium in a flash evaporator and the determination of flashing brine flow through submerged orifices. Tests were con-ducted on new type plastic louvers for use as mist separators. All studies were made at Millstone Point Laboratory near Waterford, Connecticut. (OSW) W72-08484

ALUMINUM HEAT TRANSFER SURFACES
OPERATION OF MULTISTAGE FLASH
DISTILLATION PLANT,
Reynolds Metals Co., Richmond, Va.

D. A. Fauth, and R. I. Lindberg.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price \$1.75. Office of Saline Water Research and Development Progress Report No 583, June 1970. 99 p, 7 charts, 31 fig. OSW Contract 14-01-0001-1763.

Descriptors: *Desalination plants, *Aluminum alloys, *Pilot plants, *Aluminum, *Heat transfer, Corrosion, Long-tube vertical distillation, Flash distillation, Evaporators, Design criteria, Desalination apparatus, Desalination processes, Distillation, Desalination, Saline water. Identifiers: *Heat transfer surfaces.

This study contains reports of the operation of a 50,000 gallon per day multistage flash distillation pilot plant with aluminum heat transfer surfaces from its initial start-up in June, 1968, up to June, 1970. The purpose of the plant was to test the suitability of aluminum as a material for desalting applications as well as to determine the adequacy of the plant design. The plant was designed and built with steel evaporator shells which contained bundles of aluminum tubes for the vapor condensing surfaces. Five different aluminum allovs were tested under conditions including brine up to 250F and steam to 270F. A potential dissimilar metals corrosion problem between the steel shell and the aluminum tubes was recognized and the plant was built to provide electrical insulation between all junctures of the two metals. The design proved inadequate and galvanic corrosion problems developed during the plant's operation. However, the overall performance of aluminum tubing was encouraging. It was also learned that alloys with a small magnesium content (approximately 1%) were more resistant to corrosion. W72-08485

HYDRAULIC MODEL STUDIES OF IN-TERSTAGE MODULE PIPING IN THE 2.5 MGD UNIVERSAL DESALINATION PLANT, Bureau of Reclamation, Denver, Colo. Div. of

G. L. Beichley. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price \$0.30. Office of Saline Water Research and Development Progress Report No 595, May 1970. 13 p.

Descriptors: *Revnolds number, *Froude number, *Head loss, Turbulence, Vorticles, Butterfly valves, Pipelines, Hydraulic models, Density, Piping (Mechanical), *Viscosity, Desalination plants, Brines Model tests. Identifiers: Modules, Salt solutions, Plenum

A 1:2.33 scale model was used to determine the head loss for 118 deg F (47.77 deg C) salt water brine flowing through the interstage piping between 2 of the modules in the 2.5 MGD Universal Desalination Plant. Head loss coefficient curves for the system with and without a control valve were established for Reynolds numbers ranging from 170,000 to 1,200,000. Total head loss in the prototype system was 0.53 ft (16.15 cm) without a control valve in the system and 0.56 ft (17.07 cm) with a butterfly control valve 100% open at the downstream end of the system. (OSW) W72-08487

3B. Water Yield Improvement

WATER-RESOURCES APPRAISAL OF THE PILOT CREEK VALLEY AREA, ELKO AND WHITE PINE COUNTIES, NEVADA, Geological Survey, Carson City, Nev. For primary bibliographic entry see Field 04B.

GROUND-WATER RESOURCES, CUMBER-LAND COUNTY, NEW JERSEY, Geological Survey, Trenton, N.J. For primary bibliographic entry see Field 02F.

CLOUD SEEDING EXPERIMENTS: LACK OF

BIAS IN FLORIDA SERIES, National Oceanic and Atmospheric Administra-tion, Silver Spring, Md.

G. W. Brier, G. F. Cotton, J. Simpson, and W. L.

Woodley. Science, Vol 176, No 4031, p 163-164, April 14, 1972. 5 ref.

Descriptors: *Cloud seeding, *Methodology, *Variability, *Florida, Standards, Storm structure, Clouds, Correlation analysis, Artificial precipitation, Regression analysis. Identifiers: *Statistical bias, Caribbean Sea ex-

Evidence is presented that bias is not detectable in the cloud seeding experiments over the Caribbean Sea in 1965 and over Florida in 1968 and 1970. Covariates and experimental design have been used to obtain an estimate of this bias. A description is given of the cumulus experiments and the statistical analysis of precipitation. The results in-dicate that there was no selection bias in the Caribbean and Florida series of cloud seeding experi-ments. (Lang-USGS) W72-08215

WATER SUPPLY AUGMENTATION BY WATERSHED MANAGEMENT IN WILDLAND

AREAS, Pennsylvania State Univ., University Park. School of Forest Resources.

W. E. Sopper.

Available from the National Technical Information Service as PB-206 370, \$6.00 in paper copy, \$0.95 in microfiche. National Water Commission Final Report NWC-EES-72-028, September 1971, 155 p, 10 tab, 205 ref. NWC 71-008.

Descriptors: *Phreatophytes, *Water yield improvement, *Forest management, *Watershed management, *Surface waters, Hydrology, Water management, Jouriace waters, in drougy, waters, and quality, Streamflow, Vegetation regrowth, Surface runoff, Snowmelt, Hydrologic cycle, Watersheds, Evapotranspiration.

Identifiers: *Snowpack management, Phreatophyte vegetation management.

Existing literature was surveyed and analyzed to determine the present state of knowledge regarding the extent to which water supplies can be augmented by vegetation management and the efficacy of such management methods. Effects of total and partial vegetation removal on water quantity and quality are discussed in detail. Vegetation conversion effects on streamflow are also considered. Special attention is given to snowpack management, phreatophyte vegetation management, and the potential for combining watershed management with weather modification to increase water yield. National and regional estimates of potential increases in water yield that might be obtained through vegetation manipulation are presented. An extensive bibliography is included. (NWC) PROJECT ARID DROP, A SUMMARY REPORT OF CLOUD SEEDING ACTIVITIES IN ARIZONA AS CONDUCTED BY ATMOSPHER-ICS INCORPORATED DURING THE PERIOD

ICS INCORPORATED DURING THE PERIOD 16 JULY-12 AUGUST 1971,
Atmospherics Inc., Fresno, Calif.
T.J. Henderson, and W.J. Carley.
Available from NTIS, Springfield, Va. 22151 as PB-204 604, Price \$3.00 Paper cover; 95 cents microfiche. October 1971. 14 p, 4 append. USBR Contract 14-06-D-7185.

Descriptors: *Cloud seeding, *Silver iodide, *Artificial precipitation, *Arizona, Rainfall, Aircraft, Methodology, Condensation, Nucleation, Projects, Evaluation, Chemistry of precipitation, Meteorological data. Identifiers: Project arid drop (Ariz), Research pro-

Cloud seeding activities with silver iodide in Arizona during the period July 16 through August 12, 1971, are summarized. These cloud seeding efforts were coordinated with the flight and radar activities of Meteorology Research based at Flagstaff, plus the radar surveillance provided by the Bureau of Reclamation at Show Low, Ariz. The before-during-after' observation of seeded and nonseeded single cumulus cells in the moderate develoment category indicated a significant measure of success. Results from treatment of small cumulus cells in an area where none were left untreated produced precipitation from about half of the treated cells, while the remaining cells produced only virga or no precipitation. Proper treatment of cumulus clouds initiated precipita-tion, and enhanced the total rainfall from clouds where precipitation was already in progress. (Woodard-USGS)
W72-08404

PARTIAL CUTTING AND INCREASED WATER YIELDS--A NEW MULTIRESOURCE AP-

Forest Service (USDA), Rolla, Mo. Clark National

Forest. C. P. Tryon.

Journal of Soil and Water Conservation, Vol 27, No 2, p 66-70, March-April 1972. 5 fig, 1 tab, 16

Descriptors: *Water yield improvement, *Forest management, *Cutting management, *Watershed management, Clear-cutting, Runoff, Transpira-tion, Interception, Water loss, Water conserva-

Identifiers: Partial cutting.

By assuming that volume growth is related directly by assuming that volume growth is related directly to transpirational water use and that interception losses are related directly to percent crown cover in partially stocked stands, Gingrich's central hardwood region timber stocking evaluation system was modified to predict quantitatively the effect of different partial stocking densit's on transpiration and interception water losses. These transpiration and interception water losses. These modifications constitute a practical working tool for resource managers who need to maximize water yields without clearcutting. Examples of how the tool is used are given and associated vegetation management needs are discussed. (Known 1865) napp-USGS) W72-08418

3C. Use of Water of Impaired Quality

EXPERIMENTAL IRRIGATION OF CISCAUCASIAN CHERNOZEMS WITH MINERALIZED
WATERS OF THE GULF OF TAGANROG
(OPYT OROSHENIYA PREDKAVKAZSKIKH
CHERNOZEMOV MINERALIZOVANNYMI
VODAMI TAGANROGSKOGO ZALIVA),
YUZHNYI Institut po Proektirovaniyu Vodok-

Yuzhnyi Institut po Proektirovaniyu Vodok-hozyaistvennogo i Meliorativnogo Stroitelstva, Rostov-na-Donu (USSR).

S. P. Shumeykin.

Pochvovedeniye, No 7, p 100-107, July 1971. 5 tab,

Descriptors: *Land reclamation, *Irrigation practices, *Irrigation water, *Saline water, *Chernozems, Clay loam, Soil profiles, Groundwater, Salts, Salinity, Alkalinity, Hydrogen ion concentration, Plant growth, Root zone. Identifiers: *USSR, *Ciscaucasia, Rostov Oblast, Gulf of Taganrog, Solonetzization, Mineralization.

The possibility of using mineralized waters of the Gulf of Taganrog to irrigate Ciscaucasian Cher-nozems of the Primorskaya irrigation system in the Rostov Oblast was examined. Data are given on the effect of 4 years of irrigation with these waters on the salinization and solonetzization of slightly humic, thick Chernozem clay loams. The soils are characterized by intensive accumulation of toxic salts in the root zone, solonetzization of the plow horizon, and increase in alkalinity and pH. The growth of tomatoes, cucumbers, and cabbage in 1969 was retarded; severe blighting was observed in aboveground plant parts as a result of high con-centrations of toxic salts in the irrigation water. The hazards of salinization and solonetzization generally preclude the use of waters of the gulf for irrigating productive soils of the area. (Josefson-USGS) W72-08081

MOUSE GROWTH AND REPRODUCTION IN BIOASSAYS OF WATER QUALITY FROM CERTAIN NATURAL AND MUNICIPAL WATER SOURCES IN NEW MEXICO, New Mexico State Univ., University Park. Dept. For primary bibliographic entry see Field 05F. W72-08454

3D. Conservation in Domestic and **Municipal Use**

MODELS FOR MANAGING METROPOLITAN SURFACE WATER SYSTEMS,

Cornell Univ., Ithaca, N. Y. Water Resources and

Marine Sciences Center.
For primary bibliographic entry see Field 06A.
W72-07996

LAS CRUCES LOCAL PROTECTION, LAS CRUCES, NEW MEXICO (FINAL ENVIRON-MENTAL IMPACT STATEMENT).

Army Engineer District, Albuquerque, N. Mex. For primary bibliographic entry see Field 08A. W72-08016

3E. Conservation in Industry

HIGH-QUALITY BASES FOR CUNDENSED LUBRICANTS DERIVED FROM LOW-MOLEC-ULAR OILS FROM SECONDARY REFINING For primary bibliographic entry see Field 05A. W72-07993

OXIDATION OF HYDROCARBONS ECONOMIC WAY TO PR PETROCHEMICAL PRODUCTS, PRODUCE

Vsesoyuznyi Nauchno-Issledovatelskii Institut Neftekhimicheskikh Protsessov, (USSR).

For primary bibliographic entry see Field 05A. W72-07995

3F. Conservation in Agriculture

IRRIGATION SCHEDULING USING MEAN EVAPOTRANSPIRATION RATES,
South Dakota State Univ., Brookings. D D Brosz

Paper, America Society of Civil Engineers, Irrigation and Drainage Division Special Conference, Lincoln, Nebr., 17 p, 9 fig, 3 tab, 6 ref, Oct 1971.

Descriptors: *Irrigation, *Irrigation practices, *Evapotranspiration, *Soil moisture, *Consumptive use (Water), Irrigation engineering, Water requirements, Scheduling, Corn (Field), Alfalfa, Solar radiation, Soil tests, Soil-water-plant relationships, Depletion, Tensiometers, Agricultural engineering, South Dakota.

Irrigation scheduling is one of the most difficult management decisions for irrigators--to determine when and how much water is needed. A simple, re-liable procedure was needed to make these decisions for the small farmers in South Dakota. The Jensen and Haise method of estimating evapotranspiration from solar radiation and temevapotranspiration from solar radiation and tem-perature was selected as the basic approach toward establishing an acceptable irrigation scheduling procedure. Weekly mean daily evapotranspiration values for corn and alfalfa were calculated. The State was divided into 3 areas and a set of weekly mean evapotranspiration values computed for each. Daily soil moisture balance was estimated by a water balance technique using evapotranspiration values. Estimates were checked against actual measurements throughout the 1968 and 1969 growing seasons. Comparisons of the estimated and measured levels verified the reliability and accuracy of using the calculated weekly mean daily evapotranspiration values for estimating soil moisture level. Use of these values by the farmers during the 1970 growing season resulted in better irrigation scheduling. (USBR) W72-07925

EFFECT OF ROW WIDTH AND DIRECTION, AND MIST IRRIGATION ON THE MICROCLI-MATE OF BUSH BEANS, Washington State Univ., Pullman. Dept. of Hor-

P. C. Crandall, M. C. Jensen, J. D. Chamberlain, and L. G. James. Hort Science. 6 (4): 345-347. 1971. Illus.

Descriptors: *Microclimatology, *Irrigation effi-ciency, *Relative humidity, Mist, Temperature, Winds, *Crop production. Identifiers: Air, *Beans-D, *Bush beans, *Mist ir-rigation, Phaseolus-Vulgaris-D, *Row spacing.

Tempo bush beans (Phaseolus vulgaris L.) planted in rows spaced 12-in. apart yielded 64% more crop and had 64.4% more leaf surface per unit area than and had 64.4% more leaf surface per unit area than those planted in 36-in. rows. Row direction in relation to the prevailing wind had little effect on yields but a perpendicular arrangement caused lower relative humidity and higher air temperatures than parallel. Widening the row spacing increased the effect of relative humidity. Mist applications increased relative humidity and lowered air temperature.—Copyright 1972, Biological Abstracts, Inc.

A SIMPLE AUTOMATIC WATERER FOR GROWTH ROOM OR GREENHOUSE, Department of Agriculture, Summerland (British Columbia). Research Station.

stracts, Inc. W72-07943

For primary bibliographic entry see Field 02G. W72-07950

CONSTRAINED CHANCE RESERVOIR MODEL, Harvard Univ., Cambridge, Mass. Div. of En-

gineering and Applied Physics. L. M. Eisel.

Water Resources Research, Vol. 8, No. 2, p 339-347, April 1972. 5 fig, 3 tab, 18 ref.

Descriptors: *Simulation, *Reservoir operation, Water resources, Linear programming, Optimization, Mathematical models, Stochastic processes,

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

Decision making, Systems analysis, Reliability, Hydrology, Reservoir design, Irrigation, *Model studies, *Irrigation efficiency. Identifiers: *Chance constraints, Convolution.

A chance constrained model of a single purpose irrigation reservoir is developed to determine the capacity of an irrigation reservoir and to derive an capacity or an irgation reservoir and to derive an operating policy which maximizes net economic gains from the system. Development of a model for this simple system discloses possible convolution problems associated with chance constrained models of water resource systems. A simple reservoir simulation model is developed to test the adequacy of the chance constrained model and a lag-one Markovian model is used to generate operational hydrology. Results show the model to be a non-linear separable convex programming problem. Loss function estimation is not totally al-leviated by chance constrained programming and decision makers must weigh the costs and benefits of increased reliability. Further study is necessary to determine if the possible advantages of chance constrained programming offset the mathematical complexities resulting from convolution problems.
(Bell-Cornell) W72-07997

WATERSHED MANAGEMENT: A SYSTEMS APPROACH, Harvard Univ., Cambridge, Mass. Div. of En-

gineering and Applied Physics. For primary bibliographic entry see Field 04D. W72-08000

RESULTS OF STUDYING WINTER IRRIGA-TION ON DRAINED IRRIGATED AGRICUL-TURAL FIELDS (REZUL'TATY ISS-LEDOVANIY PO ZIMNEMU OROSIENIYU NA DRENIROVANNYKH ZEMLEDEL'CHESKIKH
POLYAKH OROSHENIYA),
Severnyi Nauchno-Issledovatelskii Institut

Gidrotekhniki i Melioratsii, Leningrad (USSR). For primary bibliographic entry see Field 05D. W72-08073

DETERMINATION OF THE LOWER LIMIT OF SOIL WATER AVAILABLE TO FRUIT CROPS
(OPREDELENIYE NIZHNEGO PREDELA
POCHVENNOY VLAGI, DOSTUPNOY DLYA
PLODOVYKH RASTENIY),
Belorusskii Nauchno-Issledovatelskii Institut
Plodovodstva, Ovoshchevodstva i Kartofelya,
Minsk (USSR).

For primary bibliographic entry see Field 02G. W72-08075

INVESTIGATION OF THE FREE INFILTRA-INVESTIGATION OF THE FREE INFILTRA-TION OF WATER INTO SOIL DURING SPRIN-KLER IRRIGATION (ISSLEDOVANIYA BEZNAPORNOGO VPITYVANIYA VODY V POCHVU PRI POLIVE DOZHDEVANIYEM), Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). For primary bibliographic entry see Field 02G. W72-08076

SOME RECLAMATION CHARACTERISTICS OF SOILS OF CENTRAL CUBA (NEKOTO-RYYE MELIORATIVNYYE OSOBENNOSTI POCHV TSENTRAL'NOY CHASTI KUBY), For primary bibliographic entry see Field 04B. W72-08077

EXPERIMENTAL IRRIGATION OF CISCAUCASIAN CHERNOZEMS WITH MINERALIZED
WATERS OF THE GULF OF TAGANROG
(OPYT OROSHENIYA PREDKAVKAZSKIKH
CHERNOZEMOV MINERALIZOVANNYMI
VODAMI TAGANROGSKOGO ZALIVA),
Yuzhnyi Institut po Proektirovaniyu Vodokhozyaistvennogo i Meliorativnogo Stroitelstva,
Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 03C.

W72-08081

BASIN RECHARGE OF THE OGALLALA AQUIFER, Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 04B.
W72-08085

SEEPAGE FROM TRENCHES THROUGH NON-HOMOGENEOUS SOILS,
Egyptian Desert Institute, Cairo. Water Resources

For primary bibliographic entry see Field 04A.

FIXATION OF ATMOSPHERIC NITROGEN BY NONLEGUMES IN WET MEADOWS.

Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05B. W72-08110

EVALUATION OF COTTON RESPONSE TO RATES, SOURCES, AND TIMING OF NITROGEN APPLICATION BY PETIOLE ANALYSIS.

Alexandria Univ. (Egypt). Dept. of Soil Sciences. F. Amer, and H. Abyamin. Agronomy Journal, Vol 61, No 4, p 635-637, July-August, 1969. 1 fig, 1 tab, 12 ref.

Descriptors: *Ammonium compounds, Calcium, Nitrogen, *Cotton, *Crop response, *Rates of application, *Application methods, *Timing, *Fertilization, *Irrigation efficiency.

Identifiers: Availability coefficient, *Petiole anal-

Three experiments were conducted on a calcare-ous clay loam soil to determine the relationship between nitrate-nitrogen content of cotton (Gossypium barbadense) petiole and yield; and to employ the petiole analysis technique for evaluation of calcium nitrate, ammonium nitrate, and urea as N sources and evaluation of timing of N application. Increase in cotton yield associated with unit increment of petiole nitrate was proportional to the decrement from the maximum and the data were fitted to the exponential equation of Spillman. Cotton yield was not affected by N source and time of application, but petiole nitrate was sensitive to both. Calcium nitrate was the best fertilizer and the availability coefficients of N in ammonium nitrate were 0.714 and 0.511, respectively. Splitting the applied N in thirds proved superior to a split into two applications or to a single total application, and the availability coefficients ratios were 20.889, and 0.566, respectively. (Skogerboe-Colorado State) W72-08112

INFLUENCES OF WATER MANAGEMENT AND FERTILITY ON RICE GROWTH AND YIELD, California Univ., Davis. Dept. of Agronomy.

E. A. Oelke, and K. E. Mueller. Agronomy Journal, Vol. 61, No. 2, p 227-230, March-April, 1969. 1 fig, 4 tab, 12 ref.

Descriptors: *Rice, *Nitrogen, *Water management (Applied), Plant populations, Moisture content, *Crop production, *Crop response, Fertility, Plant growth, *Depth, *Irrigation efficiency. Identifiers: Dry weight accumulation, Leaf area.

Several water management systems for water-seeded rice (Oryza sativa L.), each with several nitrogen levels, were compared for 3 years as to their influence on growth and yield. A shallow (4cm) water depth all season consistently gave higher yields than intermediate (8cm), deep (18cm), or fluctuating (4cm and then 18cm) water depths. Relative fertility and varietal responses were similar for all water management systems. Daytime water temperature, tillers per plant, shoot dry weight, plant population, active leaf area per plant, panicles per plant, panicles per square me-ter, total nitrogen in the shoots at 30 days, and total nitrogen in the grain were greater in shallow water than in the other water managment systems. Seedling emergence and flowering were earlier in shallow water, but lodging was greater and total nitrogen in the straw was lower than in the other systems. The greater number of panicles per square meter was the yield component which con-tributed most significantly to the higher yields ob-tained with shallow water. (Skogerboe-Colorado State) W72-08113

CROP SEEDLING UPTAKE OF DDT, DIEL-DRIN, ENDRIN, AND HEPTACHLOR FROM SOILS,

Agricultural Research Service, Beltsville, Md. Crops Research Div.
For primary bibliographic entry see Field 05B.

LIAISON - KEY TO HIGHWAY AND AGRICUL-TURAL DRAINAGE PROGRAMS,
Illinois Univ., Urbana. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 06E.

W72-08115

THE R INDEX FOR PLANT WATER REQUIRE-

MENT, Environmental Data Service, Silver Spring, Md. For primary bibliographic entry see Field 02D. W72-08116

EVALUATION OF WATER AND NITROGEN STRESS ON BROMEGRASS GROWTH, Agricultural Research Service, Mandan, N. Dak. Soil and Water Conservation Research Div.

Agron J. 63 (5): 726-728, 1971. Identifiers: Brome, Bromus-Inermus-M, Grass-M, Growth, Interaction, Nitrogen, Stress.

Percent stress (reduction in growth rate of bromegrass (Bromus inermis L.) due to deficiency) was calculated by the method of Greenwood et al. to evaluate the effects of deficiencies of N, water, and N plus water combined. Dry matter water, and N plus water combined. Dry matter yields of bromegrass receiving either 270kg/ha of N, complete irrigation, N plus irrigation, or no treatment 3 weeks earlier were determined at periodic intervals in the field at low, medium, and relatively high levels of N availability. Percent stress due to N deficiency was greatest where N availability was lowest, generally increased as the cross approached mutity but was increased as grass approached maturity, but was insignificant as long as a relatively large pool of inorganic N remained in the soil. Percent stress due to water remained in the soil. Percent stress due to water deficiency was affected by precipitation, and was generally greatest for plots low in available N, even though soil water content (to 120 cm depth) was greater in those plots. Generally, percent stress due to deficiencies of water and N combined was approximately equal to the sum of stresses for the two measured separately. The concept of percent stress appears to be useful for cept of percent stress appears to be useful for quantifying the effects of both N and water deficiencies, alone and in combination, on growth rates of grass. In connection with other measures of physiological condition or activity, this concept may have considerable utility in agronomic research.—Copyright 1972, Biological Abstracts, Inc. W72-08117

EFFECT OF IRRIGATION AND CLIPPING ON SEED PRODUCTION AND CHASMOGAMY OF SERICEA GENOTYPES, Auburn Univ., Ala. Dept. of Agronomy and Soils. E. D. Donnelly, and R. M. Patterson.

Agronomy Journal, Vol. 61, No. 4, p 501-502, July-August, 1969. 2 tab, 13 ref.

Descriptors: *Seeds, Irrigation, Agriculture, Forages, *Crop production, *Irrigation effects, *Lespedeza, *Cutting management, Crop Forages, *Cre*Lespedeza, response. Identifiers: Cleistogamous, Seed yield, Clipping,

Seed yield and proportion of chasmogamous seed as affected by irrigation and clipping were deter-mined for 18 lines of sericesa, Lespedeza cuneata. Seed yields were increased by irrigation regardless of clipping management; however, irrigation did not increase the percentage of chasmogamous seed. Clipping in June drastically reduced seed yield and percentage of chasmogamous seed. Irrigation of clipped sericea further reduced chasmogamous seed percentage below that of nonirrigated clipped sericea. Lines reacted differently to irrigation and clipping both as to proportion of seed types and seed yield. (Skogerboe-Colorado State)
W72-08118

AVAILABILITY CHARACTERISTICS OF AND PLANT RESPONSE TO NITROGEN SOURCES, North Carolina State Univ., Raleigh. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W72-08119

EFFECTS OF TILLAGE, NO TILLAGE, AND MULCH ON SOIL WATER AND PLANT

GROWTH,
Agricultural Research Service, Blacksburg, Va. Soil and Water Conservation Research Div. J. N. Jones, Jr., J. E. Moody, and J. H. Lillard. Agronomy Journal, Vol. 61, No. 5, p 719-721, Sep-tember-October, 1969, 2 fig, 3 tab, 7 ref.

Descriptors: *Soil-water-plant relationships, *Cultivation, "Mulching, Management, "Water conservation, Corn, Soil moisture, Crop production, Crop response, Plant growth.

Identifiers: "Zero tillage, "Killed sod planting.

Seedbeds for corn (Zea mays L.) were prepared by both conventional tillage and the no-tillage method, each with and without surface mulches. The mulches consisted of killed grass sod on the no-tillage plots and straw applied on plots with conventional tillage. No-tillage plots without a mulch were obtained by removing the killed sod. Mulched treatments, whether of undisturbed killed sod on the no-tillage plots or of straw on conventional plots, gave the lowest values for runoff and the highest values for soil water content and vield of corn. Soil water conserved by the and yield of corn. Soil water conserved by the mulches was reflected in an average grain yield increase of 1,932 kg/ha. Differences in total soil water among treatments were significant to a water among reatments were significant to depth of 30 cm. The effect of tillage was minor, but the data indicate the value of the killed sod mulch in the no-tillage system. (Skogerboe-Colorado State) W72-08120

RECOVERY OF DIFFERENTIALLY PLACED NO3-N IN A SILT LOAM SOIL BY FIVE CROPS,

Wisconsin Univ., Madison. Dept. of Horticulture; and Wisconsin Univ., Madison. Dept. of Soil

and Wiscossin.
Science.
W. S. Dancer, and L. A. Peterson.
Agronomy Journal, Vol. 61, No. 6, p 893-895,
November-December, 1969, 1 fig, 3 tab, 14 ref.

Descriptors: *Nitrogen, Crops, Corn, Beans, Tobacco, Loam, Crop response, Soils, Irrigation. Identifiers: Nitrogen recovery.

Placement of No3-N at soils depths of 8, 23, 38, 53, and 69 cm was accomplished by an injection method with minimum disturbance to plant roots

and to the soil profile. Utilization of the dif-ferentially placed No3-N by five crops for two cropping seasons indicated that these crops varied in their ability to recover the NO3-N. Lima beans (Phaseolus lunatus L.) and green beans (Phaseolus vulgaris L.) obtained most of their N from the valgaris L.) obtained most of their N from the plow layer; while corn (Zea mays L.), tobacco (Nicotiana tabacum L.), and red beets (Beta vulgaris L.) recovered NO3-N equally well from either the plow layer or the subsoil. (Skogerboe-Colorado State)
W72-08123

SAVE THAT WATER.

Irrigation Age, p 16-19, March, 1970.

Descriptors: "Irrigation practices, "Irrigation, Irrigation design, "Irrigation efficiency, Water delivery, Water distribution (Applied), "Water reuse, Irrigation engineering, Management. Identifiers: "Texas High Plains, "Tail water return

Tail water loss and tail water return systems have Tail water loss and tail water return systems have been the subject of intensive study in the Texas High Plains for several years. These studies began in 1963 and were conducted by the High Plains Underground Water Conservation District in Lubbock. Studies indicated that on the average, 20 percent of the water being pumped will be lost without a tail water return system. Representative of the state of the tives of underground water conservation districts tives of underground water conservation districts will design tail water return systems on request of the farmer. The following information is needed for design: (1) number of wells contributing to tail water; (2) size of wells; (3) number of acres irrigated by contributing wells; (4) slope of the land; (5) type of soil. Examples of the costs and benefits of tail water systems currently in use in the Texas High Plains area are given. (Skogerboe-Colorado State) W72-08124

NITROGEN CONTENT OF GRAIN AS IN-FLUENCED BY WATER SUPPLIED TO THE

Oklahoma State Univ., Stillwater. Dept. of

Agronomy. J. F. Stone, and B. B. Tucker. Agronomy Journal, Vol. 61, No. 1, p 76-78, Janua-ry-February, 1969, 4 fig, 2 tab, 4 ref.

Descriptors: *Crop production, *Fertilization, Wheat, Sorghum, Irrigation, *Nitrogen, *Protein, Plant physiology, *Irrigation effects, Crop Identifiers: *Grain quality.

Results of independent studies involving wheat (Triticum aestivum L.) and grain sorghum (Sorghum bicolor (L.) Moench) indicate that a linear relationship exists between nitrogen fraction in the grain and the quantity of water applied to the soil surface just prior to and through vegetative growth of the plant. The effect was noted con-sistently in studies in Oklahoma and Texas. The purpose of these studies was to determine effects of fertilizer amounts and irrigation amount and timing on the production of crops. The studies were conducted at widely separated locations over eight growing seasons. The effect was noted by chance during evaluation of one of the studies and was found to exist in data found in the literature (Skogerboe-Colorado State)
W72-08125

HANDLING WATER BY COMPUTER,

Salt River Project, Phoenix, Ariz. R. J. McMullin.

Reclamation Era, Vol. 55, No. 3, p 14-17, August,

Descriptors: *Water delivery, Water supply, Computers, *Data processing, *Irrigation water, Water rights, Irrigation, *Arizona.

Identifiers: *Salt River Project (Ariz).

The computer system used for managing waters supplies in the Salt River project is described. The two system/360 central processing units at the project administrative headquarters are connected to 15 remote 1050-type communications terminals. The teleprocessing network enables employees in the project field offices to promptly and efficiently fill orders for irrigation water. The central master file contains the water rights for each acre of land, an undated record of each water account, and an an updated record of each water account, and an accounts receivable record. The computer is used to furnish water to subdivision lots and handle the billings. The system is also used for billing elec-tricity accounts. (Skogerboe-Colorado State) W72-08128

DRAINAGE DESIGN FOR MANAGING SALINE

POLLUTANTS, Bureau of Reclamation, Denver, Colo For primary bibliographic entry see Field 05G. W72-08129

EFFECT OF TIME AND METHOD OF NITROGEN APPLICATION AND SOURCE OF NITROGEN ON THE YIELD AND NITROGEN CONTENT OF CORN (ZEA MAYS L.), Ridgetown Coll. of Agricultural Tech. (Ontario).

Sous Div. C. K. Stevenson, and C. S. Baldwin. Agronomy Journal, Vol. 61, No. 3, p 381-384, May-June, 1969. 6 tab, 11 ref.

Descriptors: *Ureas, Ammonium compounds, Nitrogen, *Corn, Clays, Grains (Crops), *Crop production, *Crop response, Fertilization, *Application methods, Soil treatment, *Seasonal.

Fall plowdown, spring preplant, and side-dress ap-plications of nitrogen were compared in field ex-periments on Brookston clay, Brookston clay loam, and Haldimand silt loam soils. Ammonium nitrate, urea, and anhydrous ammonia were compared at 56, 112, 168, and 224 kg N/ha. Spring ap-plication (preplant or side-dress) producted higher grain yields than fall application in all experiments grain yields than fall application in all experiments regardless of the rate of nitrogen applied. Preplanting the nitrogen was as effective in increasing grain yield as the side-dress method. Yield results with fall-applied nitrogen were poorer on the clay soil than the loam soils. Spring application of nitrogen gave 370 to 2,610 kg/ha higher yield of corn grain than fall application on clay soils, and 200 to 1160 kg/ha higher yield of corn grain on the loam soils. No rate of nitrogen applied in the fall was found that would give the same yield as the optimum rate applied in the spring. The three was found that would give the same yield as the optimum rate applied in the spring. The three nitrogen materials gave similar results whether applied in the fall or in the spring. The nitrogen content of the grain varied with the time and method of application of nitrogen. Grain from plots that received nitrogen in the fall was markedly lower in percent nitrogen than grain from plots that received nitrogen in the spring. (Skogerboe-Colorado State) W72-08131

WIND VARIATION AND SPRINKLER WATER DISTRIBUTION,
Technion-Israel Inst. of Tech., Haifa. Dept. of

Agricultural Engineering. I. Seginer.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 95, No. IR2, p 261-274, June, 1969. 10 fig, 4 tab, 5 ref.

Descriptors: *Irrigation, *Sprinkler irrigation, *Wind velocity, Water distribution (Applied), *Irrigation efficiency, Optimization, *Distribution

The superimposed distribution pattern of a moving sprinkling lateral is not equal to that of a solid set employing the same sprinklers, whenever wind variations occur between positions of the lateral. Variations perpendicular to the lateral have the

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation in Agriculture

most significant effect, resulting in convergence or divergence of two adjacent patterns. The uniformity coefficient increases (improves) and the mean depth of water increases with increased convergence. The effect on the uniformity coefficient is more pronounced as the spacing between lateral positions increases. For every wind regime there is an optimum direction of the laterals for which the overall uniformity is highest. (Skogerboe-Colorado State) W72-08132

NUTRIENTS IN AGRICULTURAL TILE DRAINAGE.

Federal Water Pollution Control Administration, Alameda, Calif. For primary bibliographic entry see Field 05B.

SOIL WATER POTENTIAL AND WATER CON-TENT PROFILES WITH WHEAT UNDER LOW SPRING AND SUMMER RAINFALL,

Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div. R. I. PAPENDICK, V. L. Cochran, and W. M.

Woody. Agron J. 63 (5): 731-734. 1971.

Identifiers: Northwest, Pacific, Penetration, Potential, Profiles, Psychrometry, Rainfall, Root, Soil, Spring, Summer, Thermocouple, Triticum-Aestivum-M, Wheat-M.

Soil water potentials and water contents in the wheat (Triticum aestivum L.) root zone of several were measured (by thermocouple psychrometry) late in the growing season under Pacific Northwest, USA conditions of low spring and summer rainfall. All profiles exhibited low potentials in the surface 1 to 1.5 m of soil, followed by a region of steep potential gradient over a depth increment of 30 cm or more. Below this region the energy values were relatively constant with depth. In the dry zone the soil water potential in some cases reached -45 bars at the 60- or 90-cm depth. and in one case, -40 bars at the 150-cm depth. With coarser-textured soils the potential gradient across the moist to dry zone was steeper as compared with a finer-textured soil. Depth of root penetration appeared to coincide with the base of the steep water-potential gradient. Plant wilting was absent or not pronounced when potentials below the steep gradient zone were -2 bars or higher; permanent or severe wilting occurred when the potential was -10 to-8 bars. Soil water potentials in the surface 1.5 m of soil were 8 to 10 bars lower with 110 and 220 kg N/ha applications on wheat than with no N. In most cases the water content profiles of the root zone bore little resemblance to the corresponding potential profiles. These results indicate that in the field the lower limit of water extraction by wheat may reach -40 bars or lower. However, the mobility of water in the root zone or adjacent layers underlying the root zone of the field soil is probably more important to the concept of water availability for plants than the actual energy status per se.—Copyright 1972, Biological Abstracts, Inc. W72-08137

SEEPAGE FROM SHALLOW OPEN CHANNEL, Washington Univ., Seattle. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 04A. W72-08204

OPTIMAL IRRIGATION QUANTITY AND FREQUENCY, Hawaii Univ., Honolulu. Dept. of Agricultural En-

gineering.

Ipai Wu, and T. Liang.

Journal of the Irrigation and Drainage Division,

American Society of Civil Engineers, Vol. 98, No. IR1, Paper 8776, p 117-133, March 1972. 10 fig, 4

Descriptors: *Optimization, *Irrigation practices, *Operations research, Mathematical models, Cost analysis, Soil moisture, Vegetable crops, Evapotranspiration. Tensiometers, Rots, Field capacity, Lettuce, Hawaii, *Irrigation efficiency, *Crop production.
Identifiers: Celery.

Mathematical models are derived to aid in selecting optimal soil moisture levels for maximum crop yield in irrigation farming. Minimum irrigation cost over the entire growth period is selected as the principal criterion for determining optimal irrigation practices. Optimal irrigation frequency and quantity needs vary between different crops. Evaluation of the models indicates that these specific needs can be determined when irrigation costs and average consumptive use are known. Major irrigation cost consists of the expense in purchasing and delivering water and the economic losses caused by crops grown under unfavorable soil moisture conditions. The models are based upon two different irrigation practices: (1) Soil moisture kept equal or below the optimal soil moisture and (2) Soil moisture allowed to fluctuate above or below the optimal soil moisture. A technique for assessing optimal soil moisture, crop yield and cost functions is further developed from irrigation experiments in Hawaii with lettuce and celery. Results show that lettuce produces its maximum yield at soil moisture less than field capacity, and celery produces a greater yield at field capacity. This demonstrates that general irrigation practice, irrigating to field capacity, is not always the optimal irrigation schedule. (Bell-Cornell)

DISPOSAL OF LIQUID WASTES FROM PARLORS AND MILKHOUSES,

Pennsylvania Agricultural Experiment Station, University Park. For primary bibliographic entry see Field 05D. W72-08393

AVAILABILITY AND USE OF WATER IN NEBRASKA, 1970, Geological Survey, Lincoln, Neb. For primary bibliographic entry see Field 06D.

W72-08409 SELECTED TERMS IN FISH CULTURE. Food and Agriculture Organization of the United Nations, Rome (Italy). Terminology and

Reference Section.
For primary bibliographic entry see Field 07C.
W72-08414

DEEP PERCOLATION THROUGH PULLMAN SOIL IN THE SOUTHERN HIGH PLAINS, Southwestern Great Plains Research Center. Bushland, Tex. For primary bibliographic entry see Field 02G. W72-08417

SOIL LOSS FROM TILE-OUTLET TERRACES, Agricultural Research Service, Ames, Iowa. For primary bibliographic entry see Field 04D.

RESPONSE OF PLANT WATER POTENTIAL TO THE IRRIGATED ENVIRONMENT OF SOUTHERN IDAHO,
Agricultural Research Service, Kimberly, Idaho.
Snake River Research Center.

J. W. Cary, and J. L. Wright.

Agricultural Research Service, Kimberly, Idaho.

Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
Identifiers: Beta-Vulgaris-D, Climate, Environment, Hordeum-Vulgaris-M, Idaho, Irrigated, Medicago-Sativa-D, Micro, Moisture, Phaseolus-Vulgaris-D, Pisum-Sativum-D, Plant, Potential, Soil, Solanum-Tuberosum-D, Southern, Temperature, Transpiration, Triticum-Aestivum-M, Zea-Mays-M.

Laboratory studies have shown that plant water potential affects a number of key processes involved in growth, but there has been almost no information on what levels of water potential occur under irrigated conditions in the field. Plant water potential in irrigated crops of Zea mays, Triticum aestivum, Hordeum vulgare, Phaseolus vulgaris, Pisum sativum, Solanum tuberosum, Beta vulgaris, and Medicago sativa, L. was measured throughout the growing season in southern Idaho. Soil moisture conditions and potential evapotransiration were monitored. Daily changes in plant piration were monitored. Daily changes in plant water potential varied from less than 5 bars to more than 20 bars, while random sampling of supmore than 20 bars, while random sampling of supposedly homogeneous sets of plants showed an
average variation of about 2 bars. Changes due to
differences in soil moisture were also detected,
even though the soil moisture potential was kept
high enough for near-optimum crop production.
Though the crops differed widely in their response
to changes in environment, the plant water potential was strongly affected by microclimatic conditions. Day-to-day changes in plant water potential
generally correlated more closely with changes in
potential evapotranspiration than with changes in
soil moisture content. Many of the daily changes soil moisture content. Many of the daily changes observed in the plants remain unexplained, how-ever. In general, the average water potential levels of all the field-grown plants were lower than levels reported from growth chamber studies. Potentials seldom rose above -8 bars and were never observed above -5 bars.--Copyright 1972, Biological Abstracts, Inc. W72-08420

EFFECT OF PHOSPHORUS NUTRITION ON WATER METABOLISM AND WATER STATUS
IN PLANTS UNDER ADVERSE MOISTURE
CONDITIONS, (IN RUSSIAN),
Kazan Agricultural Inst. (USSR).

F. D. Samuilov Dokl Akad Nauk SSSR Ser Biol. 197 (2): 484-487. 1971 Illus.

Identifiers: Adverse, Cellular, Corn-M, Drought, Energy, Metabolism, Moisture, Nutrition, Phosphorus, Plants, Resistance, Stabilization,

One of the ways to lessen the effect of drought and flooding on the water status of plants and to increase their resistance to these unfavorable conditions is to create a high level of P nutrition at the beginning of plant development. The positive effect of high P nutrition on the water status of plants is related to favorable changes in energy metabolism and metabolism of plants which stabilize intracellular structures and maintain the normal functions of cells, which in turn leads to an increase of plant resistance to the effect of adverse moisture conditions, drought and flooding. Corn was studied.--Copyright 1972, Biological Abstracts, Inc. W72-08421

USE OF LOCAL WATER RESOURCES FOR IR-RIGATION (OROSHENIYE MESTNYMI VOD-NYMI RESURSAMI), I. A. Chuprin, and N. F. Lobov. Rossel'khozizdat, Moscow, 1970. 128 p.

Descriptors: *Irrigation, *Irrigation systems, *Irrigation practices, *Water resources development, *Farms, Crop production, Cultivation, Fertilization, Land reclamation, Flood plain zoning, Surface irrigation, Subsurface irrigation, Sprinkler irrigation, Irrigation engineering, Irrigation design, Irrigation canals, Irrigation deficiency, Irrigation operation and maintenance, Water sources, Water willimation.

Identifiers: *RSFSR, Caucasus, Volga River, Kolkhozes, Sovkhozes

This publication on irrigation was compiled on the basis of recent advances made in the application of local water resources to agricultural lands in the southern part of european Russia. The book provides information on the construction and operation of irrigation systems and describes modern

crop-irrigation practices in different geomorphological and land reclamation zones. Local water resources in dry eastern regions of the Northern Caucasus and Volga River are examined in terms of the use of these waters for irrigation by kolkhozes and sovkhozes of the area. (Josefson-USGS) W72-08430

INSTITUTIONAL INFLUENCES IN IRRIGA-

TION WATE: MANAGEMENT, Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology. L. W. Trock.

Paper presented to the Environmental Protection Agency's National Conference on Managing Ir-rigated Agriculture to Improve Water Quality. May 1972. 11 p. 4 ref. OWRR B-025-TEX (9).

Descriptors: *Irrigation, *Institutions, Drainage, Economics, Resources development, *Water allocation (Policy), Irrigation efficiency, Administra-tion, *Distribution systems, Irrigation practices, *Water rights, *Irrigation districts, Water rates. Identifiers: *Rio Grande Valley.

Among the many institutional influences that affect the development and use of water and land in the Lower Rio Grande Valley are (1) a proliferation of special districts (2) inappropriate water management policies, (3) uncertainties in water management poncies, (3) uncertainties in water rights and (4) numerous, competing governmental entities involved in planning for and administra-tion of water resources. For more efficient management of water used in irrigation of crops it is recommended that small, underdeveloped irrigation districts be consolidated, and that systems rehabilitation be accomplished. Water meters should be used to measure deliveries of water to reduce the incidence of over-irrigation and extend the supply. To overcome resistance to changes in district organizations and managerial policies, widespread and intensive educational programs, emphasizing the benefits of more efficient water management, will be necessary. To provide for desirable levels of investment in water supply and distribution systems, uncertainties of rights must be eliminated. To promote allocation of water so that it is most productively used, rights should be negotiable. A change in water laws may be necessary. Development of drainage systems to solve problems of flooding, salinity, etc. will be facilitated by cooperative efforts among state, federal, and local agencies having responsibility for flood control and drainage. Integration of water supply, drainage and flood management supply, urainage and flood management systems appears necessary. This will require considerable redevelopment of facilities and reassignment of responsibility for control of systems. (Runkles-Texas) W72-08458

THE DISTRIBUTION OF ROOTS, WATER AND MINERALS AS A RESULT OF TRICKLE IR-

Hebrew Univ., Rehovoth (Israel). Faculty of

Agriculture.
D. Goldberg, B. Gornat, and Y. Bar.
J Am Soc Hort Sci. 96 (5): 645-648. 1971. Illus. Identifiers: Distribution, Irrigation, Minerals, Roots, Salinity, Trickle.

The effect of trickle irrigation on the distribution of roots, water and minerals was studied in a 3-dimensional soil profile. Root exploration was shallow, mainly to a depth of 10 cm and concenstandow, maint to a depth of to the and content of soluble salts, including those added as fertilizer, was high in the upper 3 cm, especially midway between adjacent nozzles. When P and N were added with the irrigation water, P tended to accumulate beside and below the nozzles, while the N was leached below the nozzles and also accumulated in the area between them.—Copyright 1972, Biological AbWINTERFAT SEEDLINGS EMERGE BEST FROM SHALLOW SEEDLING, MODERATELY

Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment

H. W. Springfield.

Journal of Range Management, Vol 24, No 5, p 395-397, 1971.

Identifiers: Eurotia lanata, Seedlings, *Soil, Winterfat, *Planting management, *Soil moisture.

Seeds of winterfat (Eurotia lanata) were planted at 4 depths in 3 soils held at 5 moisture levels. Emergence was best from the 1/16-inch depth, and when soil moisture was nearer field capacity than saturation.--Copyright 1972, Biological Abstracts, Inc. W72-08471

THE REWA PEAT BOG AND RELATED CLAY

Department of Agriculture, Suva (Fiji). M. E. Adams.

Fiji Agric J., Vol 32, No 1, p 3-8, 1970. Illus. Map. Identifiers: Agriculture, Auger, *Bogs, Clay, Ferns-P, Fiji, *Peat, Rewa, Sedges-M, *Swamps.

The Rewa peat swamp covering 2200 acres on the right bank of the Rewa delta is up to 9 ft. deep, between 5 ft. and 11 ft. above mean sea level and composed of the remains of sedges and ferns. It is interspersed by silty clay horizons of alluvial origin and underlain by sandy estuarine deposits. A new type of peat auger was developed to survey the bog. It is possible that the peat may be reclaimed for pastoral use by surface drainage, or for arable use by warping.—Copyright 1972, Biological Abstracts, Inc. W72-08472

SOME RESULTS OF INVESTIGATIONS ON EROSION CONTROL IN CORN STANDS, (IN

RUSSIAN), F. A. Mironchenko, and A. T. Kolpakov Sb Nauchn Tr Donsk S-Kh Inst. 4 (3): 19-27. 1968. Identifiers: Control, Corn-M, Erosion, Furrowing, Ridging, Stands, USSR, Yield.

Ridging and furrowing with check dams at intervals of 4.2 m simultaneously with intertillages is an efficient practice enhancing retention of storm runoff and erosion in wide-row, single-grain corn stands on slopes with gradients 3-3.5 deg in the Rostov Region. The practice increased the yields of green mass with cobs of milky waxy ripeness by 10.3% on the average during 3 yr.--Copyright 1972, Biological Abstracts, Inc.

THE INFLUENCE OF MULCHING WITH PLASTICS UPON THE THERMIC AND WATER CONDITIONS IN SOIL, (IN RUMANIAN), Institutul Agronomic, Bucharest (Rumania) For primary bibliographic entry see Field 02G.

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

ALGAE CONTROL BY MIXING, STAFF RE-PORT ON KEZAR LAKE IN SUTTON, NEW HAMPSHIRE. New Hampshire Water Supply and Pollution Con-

trol Commission, Concord.
For primary bibliographic entry see Field 05G.

CONSTRAINED MODEL, Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics. For primary bibliographic entry see Field 03F.

COUNCIL BLUFF RESERVOIR, POTOSI RANGER DISTRICT, CLARK NATIONAL FOREST, IRON COUNTY, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT). Forest Service (USDA), Milwaukee, Wis. Eastern

Available from the National Technical Informa-tion Service as PB-201 863-F, \$3.00 in paper copy, \$0.95 in microfiche. August 17, 1971. 20 p, 1 map, 6

Descriptors: *Recreation facilities, *Environmental effects, *Dam construction, *Reservoir construction, *National forests, Reservoirs, National recreational areas, Conservation, Proplanning, Recreation, Streams, Lakes, Dams, planning, Recreation, Streams, Lakes, Dams, wildlife habitats, Water resources development, Recreation demand, "Missouri. Identifiers: "Environmental impact statements, "Big River (Mo.), "Clark National Forest (Mo.).

The project area will occupy 14 square miles of Ozark highland terrain in the Clark National Forest. The reservoir will be created by the con-Forest. The reservoir will be created by the construction of a dam on Big River in Iron County, Missouri. The project will change a free-flowing stream to a reservoir. Construction will have temporary effects on air and water. Public use of facilities will create the potential for more permanent effects. The stream's ecosystem will be replaced with a lake ecosystem, and upland game animal habitat will be lost through inundation. A major effect of the project will be its impact on the inhabitants of the valley. The area's economy will be changed from one oriented toward limited agriculture to one oriented to recreation. The project will aid in satisfying the future demand for outdoor recreation opportunities. The only alteroutdoor recreation opportunities. The only alter-native to the project is no development. Irreversi-ble commitments of resources include the loss of two miles of Upper Big River, inundation of 440 acres of upland, and the loss of narrow precipitous rock-walled valleys formed by the cutting action of streams. Comments of other agencies are included. (Horwitz-Florida)

CLIFTY CREEK LAKE, CLIFTY CREEK, WABASH RIVER BASIN, INDIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.

SALT CREEK LAKE, SALT CREEK, SCIOTO RIVER BASIN, OHIO (FINAL ENVIRONMEN-TAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va. For primary bibliographic entry see Field 08A. W72-08006

LAPWAI CREEK, CULDESAC, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 08D. W72-08007

FINAL ENVIRONMENTAL STATEMENT, SHOBE CANYON CHANNEL CLEARING (FINAL ENVIRONMENTAL IMPACT STATE-SHORE Army Engineer District, Walla Walla, Wash.

Available from the National Technical Informa-tion Service as PB-201 388-F, \$3.00 in paper copy, \$0.95 in microfiche. September 8, 1971. 41 p, 2 chart, 2 map, 19 append.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

Descriptors: *Oregon, *Flood protection, *Chan-nel improvement, *Environmental effects, Flood damage, Flow control, Flooding, Flood plains, Storm runoff, Flood flow, Channeling, Erosion control, Soil erosion, Surface runoff, Vegetation received: Streamflow, Channel erosion, Control regrowth, Streamflow, Channel erosion, Cost-benefit ratio, Construction costs, Project planning. Identifiers: *Environmental impact statements, Shobe Creek (Ore.).

The project consists of post-flood clearing and channel reshaping through a one mile portion of Shobe Creek, in and near Heppner, Oregon. The area is presently marked by severe flood damage. The project is designed to reduce immediate flood damage potential and act as a temporary flood control measure. Aside from reduced flooding potential, the primary environmental impact will be a change in visual qualities. Compared with present flood damage conditions, the proposed work will be an aesthetic improvement. Soil surfaces remaining after constuction will be seeded to reduce erosion and improve appearances. The only adverse effects will be temporary local disturbance from construction work and the possi-ble burning of debris. Alternatives to the project include no federal help in flood damage clean up and protection and foregoing the proposed tempo-rary protective work and attempting permanent solutions. However, permanent solutions would require extra time for implementation and result in interim community vulnerability. Moreover, local interests are not capable of taking immediate corrective action. Comments of various interested agencies are set forth. (Blank-Florida) W72-08008

YEAGER DITCH PROJECT MEASURE, SOUTHEAST TEXAS RESOURCE CONSERVATION AND DEVELOPMENT PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04D. W72-08009

COSUMNES RIVER DIVISION, INITIAL PHASE, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IM-PACT STATEMENT).
Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A.

PORT JEFFERSON HARBOR, NEW YORK NAVIGATION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, New York.

Available from the National Technical Information Service as PB-199 137-F, \$3.00 in paper copy, \$0.95 in microfiche. August 1971. 40 p, 1 map, 16

Descriptors: *New York, *Channel improvement, *Navigation, *Ships, *Dredging, *Environmental effects, Oil industry, Oil pollution, Harbors, Transportation, Turbidity, Channeling, Spoil bank, Bottom fish, Annual benefits, Water qualibank, Bottom Ish, Annua benerits, water quan-ty, Wind tides, Tides, Intertidal areas, Project planning, Oil spills, Shellfish. Identifiers: Environmental impact statements,

*Port Jefferson Harbor (N.Y.).

The project consists of channel dredging, to a depth of 40 feet at mean low water and a width of 350 feet from deep water, in Long Island Sound to the head of Port Jefferson Harbor, New York. At present T-2 tankers are delayed as long as 9 hours in waiting for high tide. Additional navigation difficulties will occur when T-2 tankers are replaced by larger, more economical tankers. The primary environmental impact of the project will be more efficient and safer water delivery of petroleum products, yielding economic benefits to the area's increasing population. The possibility of oil pollu-tion will be reduced because inbound petroleum

products would be handled with fewer but larger products would be handled with fewer but larger tankers. Construction will be performed by hydraulic dredge with the spoil disposal site to be selected during advanced planning. Dredging will cause a temporary increase in turbidity and some slight damage to shellfish habitat. Finfish and anglers would benefit from channel enlargement. No unavoidable adverse effects have been identified, except for slight damage to shellfish habitat. An alternative plan for an offshore terminal was studied but was not considered economically feasible. The but was not considered economically feasible. The comments of interested agencies are included. (Blank-Florida) W72-08011

OPEN CHANNEL WORK, OHIO RIVER, PENNSYLVANIA, WEST VIRGINIA, OHIO, KENTUCKY, INDIANA, AND ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATEMENT). Ohio River Div. Labs., Cincinnati.

Available from the National Technical Informa-tion Service as PB-202 065-F, \$3.00 in paper copy, \$0.95 in microfiche. August 19, 1971. 47 p, 19 ap-

Descriptors: *Ohio River, *Dredging, *Naviga-*Channel improvement, *Environmental effects, Transportation, Barges, Boats, Channels, Inland waterways, Turbidity, Impaired water quality, Water pollution effects, Aquatic environment, Aquatic animals, Aquatic microorganisms, Aquatic plants, Fish populations, Freshwater fish. Identifiers: *Environmental impact statements.

The project consists of annual snagging and dredging of the Ohio River to provide a minimum channel depth of 9 feet for commercial and recreational navigation. The following methods will be used for handling dredge material and snags: (1) dredging by suction dredge and disposal along the bank and in water areas; (2) dredging by dragline, clamshell, or dipper dredge into dump scows and disposal into water areas; (3) removal of snags and disposal on nearby bank areas and/or burning. The following benefits would be obtained from the project: (1) a facility for safe recreational use, (2) annual transportation savings of \$335,000,000, (3) continued operation of water oriented industrial facilities, and (4) navigation improvements. The project's adverse environmental effects include the following: (1) destruction of aquatic organisms and microorganisms; (2) the indirect effect of turbidity and suspended solids on both aquatic organisms and aquatic habitat; (3) destruction of fish cover and attractors; (4) temporary of streambank wildlife habitat; and (5) limited air pollution. Various alternatives are examined. The comments of interested agencies are set forth. (Blank-Florida) W72-08012

GREAT FALLS FLOOD CONTROL PROJECT, SUN RIVER, MONTANA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Omaha, Neb. For primary bibliographic entry see Field 08A. W72-08013

DUBOIS, PENNSYLVANIA LOCAL FLOOD PROTECTION PROJECT, SANDY LICK CREEK (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Information Service as PB-200 358-F, \$3.00 in paper copy, \$0.95 in microfiche. June 28, 1971. 14 p, 4 disc.

Descriptors: *Pennsylvania. *Flood protection. Descriptors: *Pennsylvania, *Flood protection, *Channel improvement, *Floodproofing, *En-vironmental effects, Dikes, Floodways, Reservoir construction, Alteration of flow, Average flow River beds, River flow, Bank protection, Flood routing, Non-structural alternatives, Sediment control, Silts, Water pollution sources, Turbidity, Identifiers: *Environmental impact statements, *Public (Beach)** A flood control project is proposed to reduce annual flood damages in and near Dubois, Pennsylvania. The project will consist of widening, deepening, and realignment of Sandy Lick Creek and an auxilliary channel on Falls Creek. Turbidity and sedimentation resulting from construction are the only adverse environmental effects. Contract controls will be implemented to reduce these conditions and to provide measures to reduce soil erosion from exposed banks. Present plans call for stream bank vegetation to be replaced by grass cover over 90% of the project's reach, while trees and shrubs will be planted in the remaining 10%. A variety of structural and non-structural alterna-tives were considered, including: no action, flood plain management, dikes and floodwalls, and reservoir systems. None of the alternatives would provide less adverse environmental effects than the proposed project. The project plan will also offer expanded recreation opportunity by supplementing municipal recreation facilities. No objections to the proposal were registered by state or federal entities. (Blank-Florida)

LAS CRUCES LOCAL PROTECTION, LAS CRUCES, NEW MEXICO (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Albuquerque, N. Mex. For primary bibliographic entry see Field 08A. W72-08016

SHORT BAYOU DRAINAGE DISTRICT PRO-JECT MEASURE, SOUTHEAST DELTA RC AND D PROJECT, MISSISSIPPI (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-199 656-F, \$3.00 in paper copy, \$0.95 in microfiche. May 28, 1971. 16 p.

Descriptors: *Mississippi, *Environmental effects, *Drainage systems, *Channel improvement, *Drainage programs, *Flood control, Canal construction, Channels, Soil mechanics, Floodways, struction, Channels, Sou mechanics, Floodways, Irrigation canals, Flood protection, Surface drainage, Drainage districts, Drainage area, Irrigation programs, Farms, Agricultural watersheds, Landscaping, Wild life habitats, Land clearing, Land management. Identifiers: *Environmental impact statements, *Short Bayou Drainage District (Miss.).

The project is designed to assist agriculture in Mississippi through a reduction in flooding and an improvement in surface drainage. The project consists of improving 8.2 miles of existing channels. These channels were installed many years ago but never afforded adequate protection. An accelerated land treatment program would also be initiated. There is presently little opportunity for fishing, hunting, or recreational use of the area. The environmental impact of the project includes a reduction in flood intensity and duration, a reduction in sedimentation and sheet erosion, a loss in wildlife habitat involving 47 acres of ditchbank, direct benefits to agriculture, and aesthetic losses. Adverse environmental effects include the loss of 47 acres of trees and shrubs from ditch bank construction and the loss of occasional water holding depressions for waterfowl to visit. There is no feasible alternative since the canals already exist. Annual losses will be about \$38,000 if the project is not carried out. The long term effect of the project will be the make already excellent agricultural land even better. No irreversible commitment of resources is involved. Agen-cy comment is favorable. (Grant-Florida)

OKEECHOBEE WATERWAY (VICINITY OF FT. MYERS, FLORIDA) (FINAL ENVIRON-MENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Informa-tion Service as PB-199 872-F, \$3.00 in paper copy, \$0.95 in microfiche. October 27, 1971. 44 p, 1 map,

Descriptors: *Environmental effects, *Channel improvement, *Dredging, *Florida, *Navigation, Inland waterways, Turbidity, Impaired water quality, Sediment-water interfaces, Sedimentation, Bridges, Navigable waters, Oil pollution, Excavation, Estuarine environment, Navigable

cavation, rivers, Oil spills.
Identifiers: *Environmental impact statements, *Okeechobee Waterway (Fla.), *Caloosahatchee

An enlargement is proposed for a five-mile reach of the existing Okeechobee Waterway in the Caloosahatchee River near Ft. Myers, Florida. The project would aid commercial navigation by creating longer approaches to two bridges and enlarging the channel from 8 feet deep and 90 feet wide to 10 feet deep and 100 feet wide. These improvements will reduce the possibility of oil spills. Adverse effects stem from dredging up and redepositing elsewhere approximately 80 acres of bottom biota. Temporary turbidity and siltation will also occur during dredging. No rare or endangered species of bottanical or zoological origin are known to exist in the project area. The only alternative considered was no-action. However, this would have an adverse economic impact on the Ft. Myers area. Without the enlarged channel, barges will continue to operate at less than desirable loading. Alternatives respecting disposition of the exavated material were considered. ing. Alternatives respecting disposition of the ex-cavated material were considered. The plan selected should reduce turbidity at a reasonable cost. Comments of interested agencies are included. (Kohla-Florida) W72-08019

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ut ng dy STOCKTON SHIP CHANNEL BANK PROTECTION. SAN FRANCISCO BAY TO STOCKTON, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 04D.

PARK RIVER CONDUIT, HARTFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

For primary bibliographic entry see Field 08A. W72-08021

WATER RESOURCES DEVELOPMENT IN IL-Corps of Engineers, Chicago, Ill. North Central

January 1, 1971. 138 p, 3 map, 20 photo, 4 tab.

Descriptors: *Illinois, *Water resources development, *Navigation, *Flood control, Beach erosion, Shore protection, Damages, Project postevaluation, Project planning, River basin developevaluation, Project planning, River oassi development, Multiple-purpose projects, Lake Michigan, Ohio River, Mississippi River, Missouri River, Channel improvement, Rivers, Canals, Dams, Levees, Harbors, Inland waterways, Rivers and Harbors Act, Flood plains.

Illinois Corps of Engineer projects are described. Sixteen completed navigation projects and seventy-seven flood control projects, mostly along the Mississippi River, are described. Projects under-way which either have been completed to the extent of beneficial use or which are under construction include eight extensive navigation projects, tion include eight extensive navigation projects, thirty-three flood control projects, and two beach erosion projects. Active authorized projects awaiting federal funding include one navigation project, five flood control projects, and six other projects. Other authorized projects include twenty-nine flood control projects. Projects under special con-tinuing authority include two small navigation pro-jects, seven small flood control projects, emergen-cy repairs and rescue, snagging and clearing, and flood plain information reporting. Numerous cur-rent navigation, flood control, and comprehensive basin studies are discussed. Survey investigations authorized but not started are also included for pavigation and flood control. (Grant-Florida) W72-08023

IMPROVING SURFACE WATER CONDITIONS THROUGH CONTROL AND DISPOSAL OF AQUATIC VEGETATION, PHASE I: PROCESSING AQUATIC VEGETATION FOR IMPROVED HANDLING AND DISPOSAL OR UTILIZATION, Medical Post of Assistance

Wisconsin Univ., Madison. Dept. of Agricultural Engineering; and Wisconsin Univ., Madison. Dept. of Mechanical Engineering. R. G. Koegel, H. D. Bruhn, and D. F. Livermore.

Wisconsin Water Resources Center, Madison, Technical Completion Report, 1972. 103 p, 18 fig, 3 tab, 12 ref, 7 append. OWRR B-018-WIS (4).

Descriptors: "Aquatic weed control, "Harvesting, "Dewatering, "Moisture, "Water quality, "Lakes, Wisconsin, Water pollution control. Identifiers: "Soil conditioner, Harvesting rates, Compressing, "Protein concentrate, "Silage, Presses, Rubber-covered rollers, Mechanical harvestings,"

Mechanical removal of the excess vegetation from many lakes and waterways in the U. S. is considered an ecologically sound approach. The rates at which aquatic vegetation can be harvested and subsequently handled are two major limiting factors in mechanical control of aquatic plants. Research on the latter problem is emphasized. The mass of plant material controls are proposed. mass of plant material contains about 90% moisture. Over half of this may be entrained surface moisture and can be removed by rubber-covered rollers, thus reducing the weight of material to be handled by one-half and the volume material to be handled by one-half and the volume by two-thirds of the original values. Further moisture removal may be accomplished by means of suitable presses. Chopping with conventional agricultural forage choppers improves the handling characteristics of the material by conventional conveyors and augers. Large quantities of the chopped, dewatered plant material may be spread on lawns or used as a soil conditioner. The plant material may be separated into a high liquid fraction and a high solids fraction using appropriate presses. Pressing may be preceded by a process designed to rupture a large proportion of the plant cells. Heat treatment of the material results in better dewatering characteristics and a liquid fraction which is lower in solids. A protein liquid fraction which is lower in solids. A protein concentrate has been made from the liquid fraction, and a silage-like product has been made from the solid fraction.

RESULTS OF STUDYING WINTER IRRIGATION ON DRAINED IRRIGATED AGRICULTURAL FIELDS (REZUL'TATY ISSLEDOVANIY PO ZIMNEMU OROSHENIYU NA DRENIROVANNYKH ZEMLEDEL'CHESKIKH POLYAKH OROSHENIYA), Severnyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR). For primary bibliographic entry see Field 05D. W72-08073

APPLICATION OF DIGITAL COMPUTERS TO APPLICATION OF DIGITAL COMPUTERS TO HYDRAULIC COMPUTATION OF THE RELA-TIONSHIP BETWEEN WATER LEVELS AND DISCHARGES IN RIVER DELTAS (GIDRAVLICHESKIY RASCHET SVYAZEY MEZHDU RASKHODAMI I UROVNYAMI V DEL'TAKH REK NA ETSVM), Arkticheskii i Antarkticheskii Nauchno-Iss-

ledovatelskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02E. W72-08080

PREDICTING SURFACE RUNOFF FROM AGRICULTURAL WATERSHEDS, Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02A.
W72-08082

ECOLOGICAL IMPACTS OF WATER PRO-JECTS IN CALIFORNIA, California Univ., Davis. Dept. of Water Science and Engineering. For primary bibliographic entry see Field 06G. W72-08086

SEEPAGF FROM TRENCHES THROUGH NON-HOMOGENEOUS SOILS,
Egyptian Desert Institute, Cairo. Water Resources

A. El Nimr, and R. L. Street. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR 1, Paper 8777, p 13-23, March 1972. 4 fig, 12 ref,

Descriptors: "Seepage, "Infiltration, "Soil water movement, "Irrigation ditches, "Furrow irrigation, Percolation, Unsaturated flow, Saturated flow, Drainage, Porous media.

Infiltration from shallow trenches of arbitrary cross-sectional shape and through a layer of non-homogeneous soil was studied analytically. The soil layer is underlain by a bed of gravel that is represented mathematically by a line of constant pressure. The basic flow equations were derived and the corresponding boundary value problems constructed by use of the perturbation theory. The effect of an exponential variation of the hydraulic conductivity on the quantity of segrages and the conductivity on the quantity of seepage and the free surface shape is determined. A comparison with the case of constant permeability is made for different layer thicknesses. A triangular trench was chosen to indicate the effect of trench dimenwas chosen to indicate the effect of the amount of seepage through layers of nonuniform permeability. Curves are presented to illustrate this effect. (Knapp-USGS)

VOLUME OF SNOWMELT INTERCEPTED LOGGING ROADS, Bureau of Land Management, Portland, Oreg. For primary bibliographic entry see Field 04C. W72-08088 VOLUME OF SNOWMELT INTERCEPTED BY

UPPER BEAR CREEK EXPERIMENTAL PRO-JECT: A CONTINUOUS DAILY-STREAMFLOW MODEL.
Tennessee Valley Authority, Knoxville. Div. of Water Control Planning.
For primary bibliographic entry see Field 02A.
W72-08097

LIAISON - KEY TO HIGHWAY AND AGRICUL-TURAL DRAINAGE PROGRAMS, Illinois Univ., Urbana. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 06E. W72-08115

INTERDISTRICT APPORTIONMENT INTERDISTRICT APPORTIONMENT OF FLOOD CONTROL COSTS, lowa Univ., Iowa City. Dept. of Civil Engineering. R. R. Dague, E. R. Baumann, and P. E. Morgan. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 94, No IR4, p 441-454, December, 1968. 6 fig. 1 tab, 2 ref.

Descriptors: *Drainage, *Flood control, *Legisla-tion, Cost-benefit analysis, Costs, Assessments, Taxes, *Cost sharing, *Cost allocation. Identifiers: Litigation.

Engineers are often called upon to apportion the costs of improvement works among benefiting

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

users. In some cases the procedures for making the apportionment are established. In other cases, legal statutes or engineering experience provide little information on apportionment procedures. One such case is the assessment of the costs of improvements flood-control among drainage districts on a river basin. The Statutory Code of the State of Iowa enables a part of the cost of flood control work in downstream districts to be assessed to upstream districts. The Code states that the costs shall be assessed '... in proportion to the benefits derived'. The physical characteristics of the basin were used to arrive at a formulation intended to reflect relative benefits. The benefit factors are used to calculate dollar assessments. It is concluded that the development of any formula' for assessing drainage benefits must represent a balance between the theoretical and the practical, the tangible and the intangible, and previous experience. (Skogerboe-Colorado State) W72-08121

SOME PROBLEMS CONNECTED WITH OPERATION OF DRAINAGE SYSTEMS, T. I. Daishev, and G. P. Sannikov.

International Commission on Irrigation and Drainage Bulletin, p 15-21, July, 1968 - January, 1969 2 tab

Descriptors: *Drainage, Drainage engineering, *Drainage systems, *Tile drainage, Subsurface drainage, *Freezing, *Weed control, *Herbicides, Muck soils, *Silting, Peat, Reclamation.

Factors that cause failure of individual parts of a drainage system are discussed. Particular attention is given to: the influence of kryogen phenomena on the safety and operation of drainage; protection of channels constructed in soils most subjected to the frost influence; and chemical measures for removing undesirable plants from drain channels. The main factors leading to silting of a closed drainage line are: measures for drain protection do not correspond to the nature of silting and physico-mechanical properties of soil, and the quality of construction works is not sufficiently high. Frozen mineral soils are permeable depending on moisture content during freezing. The permeability of frozen peats has not been sufficiently investigated. The main factors defining depth of peat freezing are: daily average negative temperatures in winter; snow cover density and depth; and moisture content of soil. To prevent slope deformation caused by freezing and thaw-ing, it is necessary to cover the slope surface with a 15-20 cm layer of soils which are not subject to frost influence. Use of chemical methods of weed control instead of mechanical, thermal or biological methods reduces expenses 1.5 - 2.0 times and increases labor productivity 5 - 10 times. (Skoger-boe-Colorado State) W72-08127

DRAINAGE DESIGN FOR MANAGING SALINE POLLUTANTS,

Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 05G. W72-08129

NUTRIENTS IN AGRICULTURAL TILE DRAINAGE, Federal Water Pollution Control Administration, Alameda, Calif.
For primary bibliographic entry see Field 05B.

ANALYSIS OF PROBABILITY AND RISK EQUATIONS,
Ministry of Natural Resources, Sokoto (Nigeria).

M. A. Gill.

W72-08134

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY5, p 969-971, May 1972. 4 ref, append.

Descriptors: *Flood forecasting, *Probability, *Flood recurrence interval, Frequency, Mathematical studies

Approximate versions of the probability equation used for determining design floods are proposed. The reason the probability equation plots as straight lines at long recurrence intervals is explained, as well as why deviations from the straight lines occur for short recurrence intervals. (Knapp-USGS) W72-08194

SEEPAGE FROM SHALLOW OPEN CHANNEL, Washington Univ., Seattle. Dept. of Civil En-

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY5, Paper 8875, p 779-785, May 1972. 3 fig, 4 ref, append.

Descriptors: *Canal seepage, *Open channels, *Surface-groundwater relationships, Furrow irrigation, Darcys law, Recharge, Infiltration, Hydrogeology, Numerical analysis, Irrigation, Irrigation water.

An approximate Darcy solution was obtained for the two-dimensional seepage from an open chan-nel upon a homogeneous, isotropic aquifer of relalarge depth. The linearized solution was obtained for an arbitrary channel cross section by as-suming that the maximum channel depth is small compared to the channel width. Comparison with a known exact solution for a particular channel shape suggests that this solution is probably accurate enough for design purposes when the channel depth is less than 40% of the channel width. (Knapp-USGS) W72-08204

NUMERICAL ANALYSIS OF DRAINAGE OF A HETEROGENEOUS POROUS MEDIUM, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 02G. W72-08211

RESERVOIRS WITH MIXED MARKOVIAN-I-

NDEPENDENT INFLOWS, Lancaster Univ., Bailrigg (England). Dept. of Mathematics.

A.-A. Anis, and E. H. Lloyd. SIAM Journal on Applied Mathematics, Vol. 22, No. 1, p 68-76, January 1972. 8 ref.

Descriptors: *Markov processes, *Reservoirs, Mathematical models, Water levels, Streams, *Probability, Systems analysis, *Inflow, Model

A reservoir with a stochastic mixed inflows system, consisting of a Markovian component and an independent-sequence component is discussed; results earlier established for a single Markovian inflow stream are generalized. These results are: an explicit form for the generating function of the stationary probabilities of water levels in a semi-infinite reservoir, and the ratio theorem relating these probabilities to those in a finite reservoir subject to the same inflows; and a functional equa-tion for the generating function of the times to first emptiness of a semi-infinite reservoir. The functional equation involves a latent root of the matrix generating function of the transition probabilities of the Markovian component of the inflow. (Bell-Cornell) W72-08250

COMPUTER ANALYSIS OF WATER DISTRIBUTION SYSTEMS: PART II - NUMERICAL

Medical Univ. of South Carolina, Charleston. Dept. of Biometry. C. F. Lam, and M. L. Wolla.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 98, No. HY3, Paper 8782, p 447-460, March 1972. 1 fig, 19 ref.

Descriptors: *Water distribution (Applied), *Computer programs, *Hydraulics, *Mathematical models, Algorithms, Systems analysis, *Networks, Model studies. Identifiers: *Newton-Raphson method.

A water distribution system is studied from the general nonlinear resistive network point of view.

Linear graph theory is used to derive a system of
node equations that describe the steady state of nonlinear networks. The system of nonlinear algebraic equations is generated by a digital com-puter in such form that the minimal time is required for evaluation. This set of equations is en solved by a modified Newton-Raphson algorithm that does not require the Jacobian matrix or its inverse in the iterative process. Generally, the modified Newton-Raphson method converges at a faster rate than the Newton-Raphson method. A procedure of obtaining initial values so that the iterative solution process will converge is also presented. With this technique, convergence was obtained for all of the examples attempted. It is concluded that even though the modified Newton-Raphson method converges faster than the standard Newton-Raphson process, the complexity of a problem that can be solved by it is limited by computer core size and computer time. Hence, for a large system it is probably advantageous to parti-tion the system into several smaller subsystems. (Bell-Cornell) W72-08254

CONTROL OF HYDROLOGIC SYSTEMS FOR MULTIPLE USES IN A CLOSED-LOOP FRAMEWORK, Arizona Univ., Tucson. Dept. of Systems En-

gineering.
L. Duckstein, and C. C. Kisiel.
Journal of Hydrology, Vol. 15, No. 1, p 69-76,
January 1972. 1 fig, 8 ref.

Descriptors: *Hydrologic systems, *Operations, Water resources, Stochastic processes, Mathematical models, Optimization, Constraints, Recharge, Water demand, Lakes, Aquifers, Groundwater, Inflow, *Optimum development plans. Identifiers: *Control theory.

The role of linear control theory as an aid to the integral control of hydrologic systems is investigated using the case of a combined lake and aquifer storage system. Under a quadratic loss criterion, a constrained calculus of variations problem can be solved to estimate the optimal release policy from the lake and aquifer and optimal feedback policy from aquifer to lake. Both deterministic and stochastic storage inflow are considered. Results indicate that the control theory permits better comprehension of system behavior for on-line control and permits identification of data requirements. Moreover, results reveal the need to evaluate simultaneously, as one, the identification and control problems of a system since they frequently co-exist in a natural context and do not yield optimal solutions when viewed separately. (Bell-Cor-W72-08255

THE USE OF MODELS IN PRACTICAL RESOURCE MANAGEMENT, Montreal Engineering Co. Ltd. (Quebec). For primary bibliographic entry see Field 06A. W72-08262

COMPUTER SIMULATION OF SPATIAL DIS-

TRIBUTION PATTERNS, Auckland Univ. (New Zealand). Dept. of Zoology. For primary bibliographic entry see Field 06A. W72-08268

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Control of Water on the Surface—Group 4A

RUNHYDROGRAPHS-A NEW CONCEPT ON HYDROGRAPH GENERATION, Natal Univ., Durban (South Africa). Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-08270

SOME APPLICATIONS OF STOCHASTIC HYDROLOGICAL MODELS, Imperial Coll. of Science and Technology, London (England). Dept. of Engineering Hydrology. For primary bibliographic entry see Field 06A. W72-08272

DOWNSTREAM AERATED GATE SLUICE, Escher Wyss G.m.b.H., Zurich (Switzerland). (Assignee) For primary bibliographic entry see Field 08C. W72-08297

WATER RESOURCES DEVELOPMENT IN WISCONSIN. Corps of Engineers, Chicago, Ill. North Central For primary bibliographic entry see Field 08A.

W72-08316

WATER RESOURCES DEVELOPMENT IN MINNESOTA. Corps of Engineers, Chicago, Ill. North Central For primary bibliographic entry see Field 08A.

WATER RESOURCES DEVELOPMENT IN Corps of Engineers, Chicago, Ill. North Central Div. For primary bibliographic entry see Field 08A. W72-08318

WATERSHED FIELD INSPECTIONS-1971. Committee on Public Works (U. S. House). Sub-committee on Conservation and Watershed.

Hearings-92d Cong, 1st Sess, July 17, 23, October 12, 13, November 10, 12, 1971. 545 p, 4 fig, 1 map, 22 tab, 8 chart.

Descriptors: *Watershed management, *Project benefits, *Watersheds (Basins), *Environmental effects, *Watershed Protect. and Flood Prev. Act, Water supply, Siltation, Dams, Recreation, Floods, Flood control, Legislation, Administration, Fish and wildlife, Channels, Channel improvement, Topsoil, Soil erosion, Conservation, Federal government.

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Hearings were held to gather information about the operation and impact of the watershed program. The Committee was disturbed by conserva-tionists' attacks on the watershed program, par-ticularly channel improvement. The Chairman stated this position was wrong and hoped to refute it with information gathered at the hearings. However, if there was any merit to the criticism, past mistakes would be corrected. Hundreds of watershed programs exist in the United States. Such programs aid in: (1) preventing and controlling floods, (2) halting siltation and topsoil runoff, (3) making available municipal and industrial water supplies, and (4) allowing millions of Americans to enjoy recreational facilities. The program, however, is relatively obscure and should be publicized. Hearings were held in Oklahoma, West Virginia, Georgia, Mississippi, Iowa, and Kansas. Testimony dealt with the impact of local projects. Testimony was received from local, state, and federal officials. (Ilkson-Florida) THE WATERSHED PROTECTION AND FLOOD PREVENTION PROGRAM, U.S. Congress, Washington, D.C.; and Senate, Washington, D.C. For primary bibliographic entry see Field 06E. W72-08322

UNITED STATES PORTION OF RETAMAL IN-TERNATIONAL DIVERSION DAM AND UNITED STATES DIKE, LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
International Boundary and Water Commission, El Paso, Tex. For primary bibliographic entry see Field 08A. W72-08327

SMALL-BOAT HARBOR, MISSISSIPPI RIVER AT PEPIN, WISCONSIN (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 08A. W72-08328

CLINTON LAKE, WAKARUSA RIVER, KAN-SAS (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 08D. W72-08329

NEW LONDON HURRICANE PROTECTION PROJECT, NEW LONDON, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATE-Corps of Engineers, Waltham, Mass. New England Div. For primary bibliographic entry see Field 08D. W72-08330

MILL CREEK LAKE, MILL CREEK, SCIOTO RIVER BASIN, DELAWARE AND UNION COUNTIES, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va. For primary bibliographic entry see Field 08A. W72-08331

MARTIN CHANNEL IMPROVEMENT PRO-JECT, BEAVER CREEK, LEVISA FORK OF BIG SANDY RIVER, KENTUCKY (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va.

Available from the National Technical Informa-tion Service as PB-203 157F, \$3.00 in paper copy, \$0.95 in microfiche. September 30, 1971. 22 p.

Descriptors: *Environmental effects, *Flood protection, "Channel improvement, "Flood control, "Kentucky, Channel erosion, Sediment control, Stream improvement, Channel flow, Open channels, Annual flood, Historic floods, Erosion, River flow, Running waters, Rural areas, Area redevelopment, Freshwater fish, Wildlife habitats. Identifiers: *Environmental Impact Statements, *Big Sandy River (Ky), *Beaver Creek (Ky).

Proposed improvement of the Beaver Creek Chan-Kentucky, will include enlarging the channel and realigning 4.5 miles of the Creek. While the Creek supports numerous fish and its banks provide some wildlife cover, the community and adjacent lands are subject to frequent floods. These floods are responsible for depressed economic conditions are responsible for depressed economic color and deteriorating dwellings and other structures. The project will reduce floods, thus encouraging area redevelopment. However, the project will temporarily increase erosion and sedimentation, reduce fishery potential, and eliminate some wil-dlife habitat. Construction is also likely to inconvenience local residents. Alternatives include

management of the upstream watershed to decrease the stream's silt load, operation of flood control reservoirs, construction of levees, removal control reservoirs, construction of levees, removal of rninor channel obstructions, acquisition of flood easements, imposition of zoning and building code regulations, and relocation of improvements affected by floods. The proposed plan is the optimum plan which can be developed to provide an economically effective reduction of flood hazard. Comments of concerned agencies are included. (Kohla-Florida)
W72-08332

TAYLORSVILLE LAKE, SALT RIVER, KEN-TUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Louisville, Ky. For primary bibliographic entry see Field 08A. W72-08338

YOLO COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, APPLICATION UNDER THE SMALL RECLAMATION PROJECTS ACT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-08339

LOST RIVER WATERSHED PROJECT, INDI-ANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.

GOOSE CREEK, SOMERSET COUNTY, MARY-LAND (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md.

Available from the National Technical Information Service as PB-202 642-F, \$3.00 in paper copy, \$0.95 in microfiche. October 19, 1971. 23 p, 1 map,

Descriptors: *Environmental effects, *Channel Descriptors: "Channel effects, "Channel improvement, "Dredging, "Commercial fishing, Open channels, Excavation, Docks, "Maryland, Rivers, Navigable rivers, Navigation, Turbidity. Identifiers: "Environmental Impact Statements, "Manokin River (Md), "Goose Creek (Md).

Construction of a 6 foot deep, 60 foot wide chan-nel is proposed in Goose Creek to run approxi-mately 4,400 feet from the Manokin River to, and including, a 100 by 200 foot anchorage basin 500 feet upstream. The purpose of the project is to improve navigation into Goose Creek for commercial since commercial and pleasure boats will be able to enter and dock in the Creek. However, inhabitants and the stream will experience a short-term disturbance during dredging. Impact from removal of dredged material will be negligible. Similarly, the impact of placement of that material will have only a short-term effect. No action was the sole alternative. Comments of concerned agencies are included. (Kohla-Florida)
W72-08341

WHITNEY LAKE, BRAZOS RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATE-Army Engineer District, Fort Worth, Tex.

Available from the National Technical Informa-tion Service as PB-198 910-F, \$3.00 in paper copy, \$0.95 in microfiche. April 1971. 31 p.

Descriptors: *Texas, *Environmental effects, *Dam construction, *Hydroelectric power, Flooding, River basin development, Multiple-purpose

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

projects, Public lands, Alternative planning, Area redevelopment, Project planning, Project purposes, Recreation, Water resources development, Aquatic habitats, Brushlands, Terrestrial habitats, Wildlife habitats, Water levels.

Identifiers: *Environmental Impact Statements, *Brazos River (Tex), *Whitney Lake (Tex).

Whitney Lake is a multiple-purpose project located on the Brazos River about 38 miles from Waco, Texas. The lake covers about 15,760 acres. The project is designed to raise lake elevation from 520 to 533 feet in order to provide increased hydroelectric power capacity. The environmental impact of the project will be to inundate an additional 7,800 acres of government land. Certain recreational facilities will have to be moved. While some scenic areas will be covered, the recreational area will be increased. Environmental effects include: loss of habitats for land animals due to inundation; increase in waterfowl habitats; loss of 6.100 acres of rich agricultural land; and possible loss of archeological sites. The only alternative is no action which would limit hydroelectric capacity. Long term benefits include increased power capacity and recreational use which offset adverse effects. Agency comment is generally favorable. (Grant-Florida)
W72-08342

TIOGA-HAMMOND LAKES PROJECT, TIOGA COUNTY, PENNSYLVANIA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 08D. W72-0834

TASKINAS CREEK, JAMES CITY COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.

Available from the National Technical Information Service as PB-199 499-F, \$3.00 in paper copy, \$0.95 in microfiche. May 1971. 14 p, 1 plate.

Descriptors: *Virginia, *Channel improvement, *Dredging, *Parks, *Environmental effects, Sediment control, Navigation, Boating, Marinas, Turbidity, Silting, Aquatic habitat, Oysters, Project planning, Project purposes, Channeling, Spoil banks, Navigable rivers, Estuaries, Chesapeake

Identifiers: *Environmental Impact Statements, *Taskinas Creek (Va).

Taskinas Creek, an estuary of the York River, lacks an adequate navigation channel for present and future use by recreational craft. The proposed small navigation project will involve hydraulic dredging, and it is designed to improve navigation and provide access to a large marina planned as an integral part of Taskinas State Park. The dredging will affect marine life in the immediate and adjacent area of channel construction and where dredged material is to be deposited. Resultant turbidity and silting will be temporary and are not expected to adversely affect other marine life. The project would destroy about 10 acres of shallow river bottom and 44 acres of lowland. Compensation will be made for leased oyster grounds destroyed by the project. A 'no action' alternative was considered, but this would eliminate the park's marina potential. The selected channel alignment was chosen to best serve the park's development plan. A draft environmental statement was furnished to federal and state agencies. comments are included herein. (Blank-Florida) W72-08344

PROJECT TO PLAN FOR ORDERLY DEVELOPMENT OF ARKANSAS-VERDIGRIS

WATERWAY AREA: VOLUME 1: SUMMARY REPORT.
Frontiers of Science Foundation of Oklahoma,

Frontiers of Science Foundation of Oklahoma, Inc., Oklahoma City.

Available from NTIS, Springfield, Va 22151 as COM-71-0651, Price \$3.00 paper copy; 95 cents microfiche. Final Report, May 1971. 19 p, 2 append.

Descriptors: *Navigable rivers, *Water resources development, *Oklahoma, *Arkansas, River systems, Surface waters, State governments, Planning, Ecology, Water supply, Land use, Recreation, Zoning, Reviews. Identifiers: Economic development.

Accomplishments and future planning are summarized for the navigation project on the Arkansas and Verdigris Rivers and resulting economic, industrial, and residential development in the area. Texts are included of an Executive Order from the State of Oklahoma creating a State Arkansas-Verdigris River Planning Commission of Oklahoma and proposed legislation concerned with regulations respecting public services, land use, occupancy, structures, lot and plot sizes, population density, and protection of the ecology. Recommendations include on-going river planning commissions in Arkansas and Oklahoma, establishment of an interstate compact, and specific draft legislation for each State to be implemented by a public relations program. (Woodard-USGS)

CALCULATION AND FORECAST OF ICE PHENOMENA ON RIVERS AND RESERVOIRS (RASCHETY I PROGNOZY LEDOVYKH YAVLENIY NA REKAKH I VODOKHRANILISHCHAKH).

Gidrometeorologicheskii Nauchno-Issledovatellskii Tsentr, Leningrad (USSR). For primary bibliographic entry see Field 02C.

W72-08425

LONG-RANGE FORECAST OF ICE BREAKUP ON THE OB RIVER BELOW KOLPASHEVO AND ON THE IRTYSH RIVER BELOW PAVLODAR (METOD DOLGOSROCHNOGO PROGNOZA VSKRYTIYA R. OBI NIZHE S. KOLPASHEVO I R. IRTYSHA NIZHE G. PAVLODARA)

PAVLODARA), Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR). For primary bibliographic entry see Field 02C.

PROCEDURES FOR LONG-RANGE FORECAST OF DRIFT-ICE FORMATION ON THE LOWER YENISEY AND ANGARA RIVERS (METODIKA DOLGOSROCHNOGO PROGNOZA POYAVLENIYA PLAVUCHEGO L'DA NA NIZHNEM YENISEYE I R. ANGARE), Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 02C.

HIERARCHICAL SYSTEMS: CITIES, RIVERS, ALPINE GLACIERS, BOVINE LIVERS, AND TREES,

Harvard Univ., Cambridge, Mass. Graduate School of Design.

M. J. Woldenberg. Available from NTIS, Springfield, Va., 22151 as AD-673 441, \$3.00. Harvard Theoretical Geography Paper No 19, Harvard University, July 8, 1968. 149 p., 66 tab, 110 ref, 3 append. ONR NR 389-147, Contract ONR 00014-67A-0298-0004.

Descriptors: *Model studies, *Theoretical analysis, *Systems analysis, *Watersheds (Basins), *Drainage patterns (Geologic), Geographical regions, Rivers, Glaciers, Cities, Spatial distribution, Analytical techniques, Trees, Flow nets,

Mathematical models, Synoptic analysis, Energy budget, Tributaries. Identifiers: *Hierarchical systems, *Theoretical

Identifiers: *Hierarchical systems, *Theoretical geography, Stream order, Flow analysis, Horton's Law.

Hierarchical flow systems show many characteristics derived from transmuting energy from potential to kinetic, or kinetic to potential, on surfaces. The least-work principle applied to flows over hexagonal areas explains the empirical regularities found in hierarchical systems. For fluvial (tree-like) systems, Horton (1945) and Strahler (1952; 1964) laid down principles and found evidence that various geometric parameters form direct or indirect geometric series with stream order. Literature showing relationships between the Horton and Strahler ordering techniques is reviewed. A non-integer ordering method is suggested. Because of Horton's law of stream lengths, the long profile can only be either a logarithmic function or a power function. The Horton-Strahler analysis is applied to two alpine glaciers. Central place systems are composed of towns whose numbers follow negative geometric progressions with order (Christaller, 1933). The successively smaller hexagonal partitioning of space creates nested hierarchies of market areas with area ratios of 3:1, 4:1, 7:1. The number of drainage basins per order in fluvial systems fits the same model and infers that the hexagon (spatially transformed) is a least work shape for areas served by lines. (Lang-USGS)

MICROBIOLOGICAL AND CHEMICAL ANALYSES OF TILE LINE DRAINAGE WATERS AND DEPOSITS IN IMPERIAL VALLEY, CALIF,

California Univ., Riverside. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W72-08453

4B. Groundwater Management

GROUNDWATER CONTAMINATION BY ROAD SALT: STEADY-STATE CONCENTRATIONS IN EAST CENTRAL MASSACHUSETTS, Brandeis Univ., Waltham, Mass. Environmental Studies Program.
For primary bibliographic entry see Field 05B.
W72-07962

GROUNDWATER FLOW SYSTEM ANALYSIS IN LAKE ENVIRONMENTS, WITH MANAGE-MENT AND PLANNING IMPLICATIONS, Wisconsin Univ., Madison. Water Resources Management Program. For primary bibliographic entry see Field 02F. W72-08053

SOME RECLAMATION CHARACTERISTICS OF SOILS OF CENTRAL CUBA (NEKOTO-RYYE MELIORATIVNYYE OSOBENNOSTI POCHY TSENTRAL'NOY CHASTI KUBY), E. K. Nakaidze, and F. R. Simen. Pochvovedeniye, No 8, p 36-46, August 1971. 6

Descriptors: *Land reclamation, *Soil classification, *Soil analysis, *Irrigation practices, *Water management (Applied), Groundwater, Precipitation (Atmospheric), Excess water (Soils), Moisture deficit, Permeability, Infiltration, Meteorological data, Soil properties, Topography, Land use. Identifiers: *USSR, *Cuba, Matanzas Province, Mineralization.

Soils of the Matanzas Province in west-central Cuba are being intensively used in irrigation agriculture. Uneven distribution of precipitation leads to widespread excess moisture in summer and to acute moisture deficiency during the

remainder of the year. Prolonged pumping of large remainer of water for irrigation during the dry amounts of water for irrigation during the dry period causes a sharp rise in groundwater mineralization in the region of marine plains. Ir-rigation in the province should be based on regulated flow of both large and small rivers and on lated flow of both large and small rivers and on proper use of groundwaters, which play a vital role in crop irrigation. Five reclamation districts are identified in the province on the basis of topography, groundwater depth, soil formation conditions, and land use. Groups, subgroups and series of soils of the province are tabulated along with data on their chemical characteristics and hydraulisanesseries (Isosfore 11868). lic properties. (Josefson-USGS) W72-08077

AUGER-HOLE HYDRAULIC CONDUCTIVITY: FIRST VERSUS SECOND TEST,
Agricultural Research Service, Reno, Nev. Soil
and Water Conservation Research Div. For primary bibliographic entry see Field 02G. W72-08084

BASIN RECHARGE OF THE OGALLALA AQUIFER,

Southwestern Great Plains Research Center.

V. S. Aronovici, A. D. Schneider, and O. R. Jones. Journal of Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR 1, Paper 8760, p 65-76, March 1972. 8 fig, 1 tab, 13

Descriptors: *Pit recharge, *Water spreading, *Great Plains, *Texas, *Playas, Water management (Applied), Artificial recharge, Irrigation water, Evaporation control, Water storage, Infiltration, Percolation.
Identifiers: *Ogallala aquifer (Tex), *High Plains

(Tex).

J. R. Harrill.

Groundwater recharge basins were tested to determine the feasibility of percolating surface water to the Ogallala Formation in the Texas High Plains. The basins were excavated into porous sediments which separate the groundwater formation and the slowly permeable surface soil. Initially, two 1/10acre basins were tested, one with clear well water acre basins were tested, one with clear well water and the other with turbid water from a playa (wet weather) lake. Percolation rates with clear well water were as high as 7 ft per day, and the sustained percolation rate with turbid water exceeded 1 ft per day. Results of the initial study were used to design and construct a 1.0-acre basin that can be filled by gravity flow from a playa lake. The maximum percolation rate during a 2-week test with clear well water was 2.0 ft per day. The Ogallala Formation can be recharged through basins if the slowly permeable surface soil is removed. (Knapp-USGS) W72-08085

WATER-RESOURCES APPRAISAL OF THE PILOT CREEK VALLEY AREA, ELKO AND WHITE PINE COUNTIES, NEVADA, Geological Survey, Carson City, Nev.

Nevada Division of Water Resources, Water Resources-Reconnaissance Series Report 56, 1971. 46 p, 2 fig, 1 plate, 11 tab, 32 ref.

Descriptors: *Water resources, *Appraisals, *Groundwater, *Surface waters, *Nevada, Hydrogeology, Hydrologic budget, Water wells, Streams, Water yield, Water quality, Hydrologic data, Basic data collections, Aquifers, Groundwater recharge, Water supply, Water users, Model studies, Transmissivity, Storage coefficient, Evapotranspiration, Precipitation (Atmospheric), Runoff, Chemical analysis.

Identifiers: *Pilot Creek Valley area (Nev), *Elko County (Nev), *Pine County (Nev).

The reconnaissance studies of groundwater development in 5 valleys in the Pilot Creek Valley area of Nevada describe the hydrologic environ-

ment; appraise the source, occurrence, move-ment, and chemical quality of water in the area; estimate average annual recharge to and discharge from the groundwater reservoir; provide prelimi-nary estimates and perennial yield and transitional storage reserve; and estimate present and evaluate potential development in the area. The 5 valleys are Pilot Creek, Great Salt Lake Desert, Antelope. are Pilot Creek, Great Salt Lake Desert, Antelope, Deep Creek, and Tippett. Ranching and mining are the principal industries. Irrigation is limited to about 160 acres of hay in Pilot Creek Valley, about 800 acres of meadow along Spring Creek in Deep Creek Valley, and about 40 acres of hay and pasture in Tippett Valley. Samples of well, stream, and spring waters from Antelope Valley, Tippett Valley, Deep Creek Valley, and the northern part of Pilot Creek Valley, and the northern part of Pilot Creek Valley were generally suitable for irrigation and domestic use, but samples from the southern part of Pilot Creek Valley and from Great Salt Lake Desert were highly mineralized. The average annual water yield in the study area is 17,500 acre-feet. (Woodard-USGS)

GROUND-WATER RESOURCES, CUMBER-LAND COUNTY, NEW JERSEY, Geological Survey, Trenton, N.J. For primary bibliographic entry see Field 02F. W72-08096

PRELIMINARY FIELD STUDIES USING EARTH RESISTIVITY MEASUREMENTS FOR DELINEATING ZONES OF CONTAMINATED GROUND WATER, Federal Water Pollution Control Administration,

Cincinnati, Ohio. Ohio Basin Region.
For primary bibliographic entry see Field 05B.
W72-08109

HYDROGEOLOGIC CONSIDERATIONS IN THE SITING AND DESIGN OF LANDFILLS. G. M. Hughes.

Illinois State Geological Survey, Environmental Geology Notes, Number 51, April 1972, 22 p, 5 fig,

Descriptors: *Hydrogeology, *Landfills, *Sites, *Planning, Leachate, *Waste disposal, Quality control, Environment, Economics, *Illinois, Water pollution Identifiers: Northeastern Illinois.

Some of the effects of hydrogeologic factors on landfills and the relation of these factors to landfill design under the geologic and climatic conditions prevailing in Northeastern Illinois are described. The conclusions reached are applicable to other areas only insofar as conditions are similar to those in Northeastern Illinois. (1) Almost all waste disposal operations contribute some microbial and/or chemical contaminants to the environment. At some sites the natural environment contains or attenuates these contaminants satisfactorily, and at other sites man made controls must be added. (2) Landfills could be constructed in almost any of (a) Landmis could be constituted in aminost any in the hydrogeologic environments present in Northeastern Illinois, provided that a suitable design is used for each particular environment and that the use of the site after the fill has been completed is considered. Where natural conditions are insidented to the could be a considered. are inadequate to reduce to a tolerable level the dissolved solids content of leachate moving from a landfill, engineering techniques may be employed tanding, eightering techniques hay be employed to achieve this purpose. In some cases it may be economical to improve an otherwise unsuitable site if money can be saved on such items as land cost and transport of refuse. (Strachan-Chicago) W72-08162

PRACTICAL CORROSION AND INCRUSTA-TION GUIDE LINES FOR WATER WELLS, Universal Oil Products Co., St. Paul, Minn. John-

J. L. Mogg. Ground Water, Vol 10, No 2, p 6-11, March-april 1972. 1 fig, 6 tab, 3 ref.

Descriptors: *Water wells, *Corrosion, *Well filbescriptors. water weins, 'Cortoson, 'Weir In-ters, 'Chemical precipitation, 'Fouling, Water chemistry, Chemical potential, Iron bacteria, Water properties. Identifiers: Water well incrustation.

Corrosion and incrustation of water wells are defined and classified into groups which fit most field problems, and case histories are discussed. An index for the magnitude of corrosion is presented along with a list of recommendations for well-construction materials. Recommendations are also made for minimizing the rate of incrustation in wells supplying water known to be incrusting. Treatments for incrusted wells are described. A ten-year case history of iron bacteria fouling is presented. (Knapp-USGS) W72-08186

THE STATE OF THE ART IN OPTIMAL CON-JUNCTIVE USE OF GROUND AND SURFACE WATER SYSTEMS, California Univ., Los Angeles, Dept. of Engineer-

ing Systems.

J. A. Dracup. Paper presented at La Planificacion del Uso de los Recursos Hidraulicos en Chile, September 20-24, 1971. Santiago, Universidad de Chile, Departmento de Industrias Publicación No 71/14/C. 1 fig. 20

Descriptors: *Water management (Applied), *Surface-groundwater relationships, *Mathematical face-groundwater relationships, *Mathematical models, *Linear programming, *Dynamic programming, Simulation, Optimization, Recharge, Model studies.

Through the development of mathematical models, it is concluded that the conjunctive use of ground and surface water systems allows for the utilization of both systems in the optimal economic manner. An optimal policy is defined as one that maximizes benefits and/or minimizes cost. Two modeling approaches are used: parametric linear programming, permitting reuse of reclaimed waste-water for municipal and industrial purposes and allowing a decision to pump and recharge simultaneously; and dynamic pro-gramming, using a system which includes surface reservoirs, streams, recharge facilities, distribution pipelines and aquifers. The capabilities of the two water systems are discussed and shown to complement each other. For example, distinct advantages of groundwater are constant temperature, slow movement, and greatly reduced evaporation losses. In many instances, however, long time periods between major flows virtually preclude long-term carryover surface storage because of the excessive evaporation losses. Where such flows can be utilized to recharge a groundwater basin, the usefulness of the basin can be greatly increased. (Bell-Cornell) W72-08247

A BILL TO PROVIDE FOR THE REGULATION OF GROUND WATERS WITHIN THE UNITED STATES AND THE SUBSURFACE DISPOSAL OF WASTES.

For primary bibliographic entry see Field 06E. W72-08347

GEOHYDROLOGY OF THE EASTERN PART OF PAHUTE MESA, NEVADA TEST SITE, NYE COUNTY, NEVADA, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 02F.

W72-08407

AVAILABILITY AND USE OF WATER IN NEBRASKA, 1970, Geological Survey, Lincoln, Neb. For primary bibliographic entry see Field 06D.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

WATER WELL AND GROUND-WATER CHEMICAL ANALYSIS DATA, GLASSCOCK COUNTY, TEXAS, Texas Water Development Board, Austin. H. E. Couch, and D. A. Muller. Report 143, March 1972. 68 p, 3 fig, 2 tab.

Descriptors: "Groundwater, "Hydrologic data, *Basic data collections, "Water wells, "Texas, Water quality, Chemical analysis, Pumping, Water yield, Water users, Water level fluctuations, Water supply, Aquifers. Identifiers: "Glasscock County (Tex.), Water well

inventory.

A field inventory of water wells in Glasscock A rieia inventory of water wells in classcock County, Texas, was conducted from April to September 1966. Approximately 1,032 wells were inventoried and 160 water samples were taken for chemical analysis. Land owners, lessees, and county officials were contacted to obtain the most county officials were contacted to obtain the most complete information on each well whether domestic, livestock, irrigation, industrial, or public supply. The static water level and total depth, where possible, were measured at each well. Selected basic data from previously published groundwater reports were tabulated for purposes of comparison and continuity in showing the trend of lowerine water tables throughout the the trend of lowering water tables throughout the last three decades of increased pumpage. (Woodard-USGS) W72-08416

4C. Effects on Water of Man's Non-Water Activities

ECOLOGICAL IMPACTS OF WATER PRO-JECTS IN CALIFORNIA, California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 06G.

VOLUME OF SNOWMELT INTERCEPTED BY

LOGGING ROADS, Bureau of Land Management, Portland, Oreg E. R. Burroughs, Jr., M. A. Marsden, and H. F. Haupt.

Journal of Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR 1, Paper 8770, p 1-12, March 1972. 7 fig, 3 tab, 13 ref.

Descriptors: *Snowmelt, *Infiltration, *Seepage, *Roadbanks, *Overland flow, Subsurface runoff, Snow cover, Roads, Runoff, Runoff forecasting, Snowpacks, Lumbering, Montana, Idaho.

Snowmelt runoff into two 100-ft sections of logging road near the Montana-Idaho border was measured from 1965 to 1967. For two years, subsurface seepage from the road cut was measured. Seepage flow may be predicted for one section using the observed flow in the other section. In 1967, the overland flow barriers were removed from one section and the total runoff volume-seepage flow plus overland flows was measured. Of the total daily runoff, 58% was seepage flow and 42% was overland flow. The average total flow volume which entered 100 ft of logging road was 0.29 acre-ft per day and the average peak discharge rate was 0.26 cfs. (Knapp-USGS) W72-08088

ENVIRONMENTAL SPOILAGE IN THE USSR, Aston Univ., Birmingham (England). Dept. of Industrial Administration. For primary bibliographic entry see Field 05B.

SYNTHETIC STORM PATTERN AND RUN-OFF FOR GAUHATI, INDIA, Calcutta Metropolitan Planning Organization (In-

For primary bibliographic entry see Field 02A.

EFFECT OF SOME PERENNIAL LEGU-MINOSAE AND GRAMINEAE ON THE CON-SERVATION OF SOIL AND WATER, (M SER-

BO-CROATIAN), Agricultural Inst., Skopje (Yugoslavia). Gjorgi, Bandzo, and Dimitar, Popovski. Arh Poljoprivr Nauke. 23 (80): 66-78. Illus. 1970.

English summary. Identifiers: Conservation, Cover, Gramineae-M, Leguminosae-D, Medicago-Falcata, Medicago-Media-D, Medicago-Sativa-D, Onobrychis-Sativa-D, Penetration, Perennial, Plant, Porosity, Root,

Experiments were conducted on 20m2 plots on an 18 degree slope. Runoff water and denuded material were collected periodically from each plot. The surface horizon was of loam and the B horizon, heavy clay. Runoff was found in smallest amount on the plot under Onobrychis sativa. The deeply penetrating spindle-shaped roots of O. sativa contributed to better porosity thus facilitating the penetration of water into the deeper soil horizons. A favorable effect of Medicago sativa and M. media on soil and water conservation was also observed. The effect of the most productive asso observed. The effect of the most productive species, M. falcata on soil and water conservation was lower than that of the other crops because of belated vegetation in the spring, and interrupted vegetation in the summer. The protective effect of vegetation in the saminer. The protective effect of individual species depended not only on the amount of vegetation above ground but also on the area covered by the vegetation during the year.—Copyright 1972, Biological Abstracts, Inc. W72-08219

AN AESTHETIC OVERVIEW OF THE ROLE OF WATER IN THE LANDSCAPE, California Univ., Berkeley. Dept. of Landscape

Architecture.
For primary bibliographic entry see Field 06B.
W72-08383

WATER SUPPLY AUGMENTATION BY WATERSHED MANAGEMENT IN WILDLAND

Pennsylvania State Univ., University Park. School of Forest Resources. For primary bibliographic entry see Field 03B. W72-08384

PARTIAL CUTTING AND INCREASED WATER YIELDS--A NEW MULTIRESOURCE AP-

PROACH. Forest Service (USDA), Rolla, Mo. Clark National

For primary bibliographic entry see Field 03B. W72-08418

ASSESSING ORGANIC POLLUTION FROM AGRICULTURAL, URBAN, AND WOODED

LANDS, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 05B. W72-08456

4D. Watershed Protection

WATERSHED MANAGEMENT: A SYSTEMS APPROACH.

Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.

Water Resources Research, Vol. 8, No. 2, p 326-338, April 1972. 6 fig, 2 tab, 19 ref.

Descriptors: *Watershed management, *Irrigation water, *Environmental control, *Decision making, *Systems analysis, Mathematical models

Stochastic processes, Recreation demand, Forest management, Range management, Risks, Hydrologic cycle, Streamflow, Surface runoff, River flow, Sedimentation, Reservoir, River flow, Sedimentation, Reservoir, Ecosystems, Wildlife. Identifiers: *Water resource system, Chance constraints, Wildlands, Western United States.

A systems approach is developed to determine the type and extent of land use management activities in wildland areas. A chance constrained pro-gramming model is applied to a hypothetical watershed in order to investigate the effects of risk and uncertainty on land use management decisions. The model solution indicates that risk and uncertainty associated with the system of physical and economic parameters can significantly affect land use management policy-making. The solution also indicates that forest management practices to increase streamflows may have only a minimal effect on the design and operation of downstream reservoirs, and that future outdoor recreational demand and benefits are important factors to con-sider in the arrangment of land use management activities. (Bell-Cornell)

YEAGER DITCH PROJECT MEASURE, SOUTHEAST TEXAS RESOURCE CONSERVA-TION AND DEVELOPMENT PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Soil Conservation Service, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-201 305-F, \$3.00 in paper copy, \$0.95 in microfiche. September 29, 1971. 14 p, 7

Descriptors: *Texas, *Flood protection, *Channel improvement, *Surface runoff, *Environmental effects, Flood damage, Flood control, Flood recurrence interval, Channeling, Dredging, Sediment control, Erosion control, Wildlife habitats, Habitat improvement, Vegetation regrowth, Soil erosion, Soil conservation, Agricultural runoff, Surface waters, Project planning.

Identifiers: *Environmental impact statements, *Orange County (Tex).

The proposed action consists of Channel improvement to solve land and resource problems in the Yeager Ditch drainage area located in Orange County, Texas. At present Yeager Ditch can not adequately convey the runoff originating within the project area, and flooding occurs frequently resulting in direct flood damage to residential, business, and agricultural properties. The following favorable effects are listed: (1) reduce erosion and sediment production, (2) protect against flood-water damage up to and including a 100-year frequency event, (3) restore property values and opportunity for home improvements, (4) create wildlife habitats, and (5) reduce sediment deposition. Construction of channel improvement will adversely affect some wildlife habitats and destroy or disturb some vegative cover. Revegeta-tion, however, will occur on much of this area. There is no alternative method, other than channel improvement, which will provide flood protection and meet the objectives of local organizations and and meet the objectives of local organizations and residents. The comments of appropriate federal, state, and local interests are included. (Blank-Florida) W72-08009

DUBOIS, PENNSYLVANIA LOCAL FLOOD PROTECTION PROJECT, SANDY LICK CREEK (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Pittsburgh, Pa.

For primary bibliographic entry see Field 04A. W72-08014

STOCKTON SHIP CHANNEL BANK PROTECTION. SAN FRANCISCO BAY TO STOCKTON,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05 Identification of Pollutants-Group 5A

CALIFORNIA (FINAL ENVIRONMENTAL IM-PACT STATEMENT).
Army Engineer District, Sacramento, Calif.

Available from the National Technical Informa-tion Service as PB-199 873-F, \$3.00 in paper copy, \$0.95 in microfiche. October 14, 1971. 69 p, 2 plate,

Descriptors: *Environmental effects, *Channel erosion, *Channel improvement, *California, Banks, Dredging, Slope stability, Levees, Retaining walls, Shore protection, Revegetation, Bank erosion, Vegetation, Shoreline cover, Vegetation establishment, Wildlife management.

Identifiers: *Environmental impact statements, *Stockton Ship Channel (Calif.).

A bank protection project is proposed covering six critical erosion areas along the San Francisco Bay-Stockton, California ship channel. Rock revetments will be constructed and levees restored. The impact of the project will focus on the removal of riparian vegetation. However, the extent and quality of this vegetation is not considered signifi-cant; proper planning can further minimize damage. Wildlife should return after the vegetation cover is re-established. Only minor water quality impairment will be created by dredging incidental to levee restoration. Alternatives include deletion of federal bank protection, levee setback. waterside berm construction, concrete block bank protection, and flatter levee slopes with vegetation protection. These alternatives were rejected as either impractical, inadequate, or too expensive. The comments of concerned agencies are included. (Kohla-Florida) W72-08020

A NUMERICAL ANALYSIS OF HIGH ALTITUDE SCRUB VEGETATION IN RELATION

TO SOIL EROSION IN THE EASTERN COR-DILLERA OF PERU, Saint Andrews Univ. (Scotland). Dept. of Botany. R. M. M. Crawford, D. Wishart, and R. M. Campbell.

Journal of Ecology 58 (1): 173-191. 1970. Illus.

Descriptors: *Soils, *Erosion controls, *Vegeta-Identifiers: Cordillera, *Peru, *Scrub vegetation.

A survey of the distribution of high altitude scrub vegetation growing at the tree-line was carried out in a densely settled valley in southeastern Peru. A lengthy period of human settlement has reduced the tree-line by nearly 850 m (2800 ft) below the climatic optimum. The scrub vegetation left covering much of the valley floor and mountainsides is thought to be essential to the maintenance of adequate water reserves in the soil for agriculture as well for preventing a rapid acceleration of erosion. No previous ecological study has been reported for this scrub and this investigation uses 20 different numberical methods in an attempt to relate the distribution of the scrub species associations to altitude and aspect. Characteristic scrub types are found in the upper and lower regions of the valley. These are described together with transitional types found in the middle altitudinal ranges and suggestions are made in relation to conservation of the scrub and the prevention of further erosion.—Copyright 1972, Biological Abstracts, Inc. W72-08055

UPPER BEAR CREEK EXPERIMENTAL PRO-JECT: A CONTINUOUS DAILY-STREAMFLOW MODEL.

Tennessee Valley Authority, Knoxville. Div. of Water Control Planning. For primary bibliographic entry see Field 02A. W72-0809

EFFECT OF SOME PERENNIAL LEGU-MINOSAE AND GRAMINEAE ON THE CON-SERVATION OF SOIL AND WATER, (M SER-

BO-CROATIAN), Agricultural Inst., Skopje (Yugoslavia). For primary bibliographic entry see Field 04C. W72-08219

AN ECONOMIC ANALYSIS OF EROSION AND SEDIMENT CONTROL FOR WATERSHEDS UNDERGOING URBANIZATION, Dow Chemical Co., Midland, Mich. For primary bibliographic entry see Field 05G. W72-08246

WATERSHED FIELD INSPECTIONS-1971. Committee on Public Works (U. S. House). Sub-committee on Conservation and Watershed. For primary bibliographic entry see Field 04A. W72-08320

MARTIN CHANNEL IMPROVEMENT PRO-MARIIN CHANNEL IMPROVEMENT PRO-JECT, BEAVER CREEK, LEVISA FORK OF BIG SANDY RIVER, KENTUCKY (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va. For primary bibliographic entry see Field 04A. W72-08332

SOIL LOSS FROM TILE-OUTLET TERRACES, Agricultural Research Service, Ames, Iowa. J. M. Laflen, H. P. Johnson, and R. C. Reeve. Journal of Soil and Water Conservation, Vol 27, No 2, p 74-77, March-April 1972. 3 fig. 4 tab, 8 ref.

Descriptors: *Soil erosion, *Terracing, *Erosion control, *Sediment control, Sediment yield,
*Iowa, Water pollution control, Land manage-ment, Particle size, Sampling, Data collections.

Average annual soil loss from four tile-outlet terrace systems in Iowa was less than 750 pounds per acre and less than 5 percent of soil erosion between terraces. Sediment concentrations averaged between 800 and 3,850 parts per million. Most soil lost consisted of particles and aggregates with diameters less than 0.016 millimeter. (Knapp-USGS)
W72-08419

SOME RESULTS OF INVESTIGATIONS ON EROSION CONTROL IN CORN STANDS, (IN RUSSIAN), For primary bibliographic entry see Field 03F.

W72-08486

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

THE ECOLOGY OF THE PLANKTON OFF LA JOLLA, CALIFORNIA, IN THE PERIOD APRIL THROUGH SEPTEMBER, 1967. California Univ., Berkeley.
For primary bibliographic entry see Field 05C.

THE ADDITION METHOD IN PHOTOMETRY. III. THE DETERMINATION OF METAL IONS
FROM THE SELF-COLOUR OF THEIR AQUEOUS SOLUTIONS, (IN GERMAN),
Marburg Univ. (West Germany). Chair for
Analytical Chemistry.
H. Bondorf, and C. Mahr.

Zeitschrift fur Analytische Chemie, Vol. 256, No. 2, p 110-112, September 14, 1971. 14 ref. English

Descriptors: *Metals, *Aqueous solutions, *Copper, *Cobalt, *Chromium, *Iron, *Nickel, Water analysis, *Photometry, Color, Absorption, Reduction (Chemical), Heavy metals. Identifiers: Absorption coefficient, Ions.

Standard curves for the photometric determina-tion of Cu (++), Ni (++), Co (++), Fe (+++) and Cr (+++), using the color of their aqueous solutions, are not suitable if the composition of the solutions is unknown. It is more useful to determine the respective absorption coefficient of the ions in the solution by adding a known amount of the element. Fe (+++) is reduced to Fe (++), then the absorption of Fe (++) is measured at 920 mm. Cr (+++) must be exidized to CrO4 (-) and then be reduced again. The standard deviation of the procedures described exceeds 1 percent only in a few cases. The possibility of determining in the same manner two or three compounds in the presence of each other is mentioned. (Mortland-Battelle) W72-07893

METHOD FOR THE DETERMINATION OF TRACES OF MERCURY BY FLAMELESS ATOMIC ABSORPTION, (IN GERMAN), Farbenfabriken Bayer A.G., Dormagen (West Germany). Wissenschaftlisches Laboratorium.

Zeitschrift fur Analytische Chemie, Vol. 257, No. 3, p 187-191, December 20, 1971. 17 ref. English

Descriptors: *Heavy metals, *Trace elements, Water analysis, Urine, Reduction (Chemical), Organic matter, *Mercury, *Spectrophotometry.

Identifiers: *Atomic absorption specganc matter, spectury, considering spectrophotometry. Identifiers: "Atomic absorption spectrophotometry, Soda liquor, Diethyl pyrocarbonate, Precision, Detection limits, Chemical interference, Sample preparation, Atomic absorption spectrophotometry, Laboratory techniques.

The determination of traces of mercury after reduction by stannous chloride in solution is described. The reduced elementary mercury is transported by an air stream into an absorption cell placed in the beam of a hollow cathode lamp or a low pressure burner. The energy decrease at 254 low pressure ourner. The energy decrease at 234 mm is a measure for the mercury present. Methods for sample preparation of gases, water, soda liquor, urine, diethyl pyrocarbonate and other organic materials are described. With this method 0.2 ppb of mercury can be determined. Compared to flame atomic absorption there is an increase in sensitivity by 10,000. The method is suitable for inorganic and organic bound mercury and is applica-ble for all problems, if a suitable sample preparation is possible. By a compensation method (deuterium arc background corrector) interferences by other UV-absorbing substances are largely eliminated. (Mortland-Battelle)

THERMAL INACTIVATION OF VIRUSES, RE-PORT 1. THE RELATIONSHIP BETWEEN THE RATE OF INACTIVATION AND TEMPERA-TURE,

Institute of Virology, Moscow (USSR).
For primary bibliographic entry see Field 05C.

A HYDROBIOLOGICAL STUDY OF THE POL-LUTED RIVER LIEVE (GHENT, BELGIUM), Rijksuniversitair Centrum Antwerpen (Belgium). Lab. of Ecology.
For primary bibliographic entry see Field 05C.

RADIOCHEMICAL SEPARATIONS WITH HALOGENATED RESINS, Instituto Venezolano de Investigaciones Científicas, Caracas (Venezuela). Departamento de Tecnologia Nuclear.

M. Heurtebise, and W. J. Ross.

Group 5A-Identification of Pollutants

Analytical Chemistry, Vol. 44, No. 3, p 596-599, March 1972, 3 fig, 1 tab, 4 ref.

Descriptors: *Neutron activation analysis. Radioisotopes, *Radiochemical analysis, *Urine, Chemical analysis, Halogens, Separation techniques, Anion exchange, Resins, Ions, Gamma rays, Tracers, Chlorine radioisotopes, Gold radioisotopes, Uranium radioisotopes, Iodine radioisotopes, Arsenic radioisotopes, Potassium radioisotopes, Arsentium radioisotopes,
*Iodine, Cobalt radioisotopes, *Mercury, *Gold,
*Bromine, Zinc radioisotopes, Cadmium radioisotopes.

Identifiers: Biological samples, Chemical interference, Mercury radioisotopes, Bromine radioisotopes, Iron radioisotopes, Silver, Sulfate radioisotopes, Selenate radioisotopes, Phosphate radioisotopes, Sodium radioisotopes, Rubidium radioisotopes, Cesium radioisotopes, Magnesium radioisotopes, Calcium radioisotopes, Maginesium radioisotopes, Calcium radioisotopes, Barium radioisotopes, Silver radioisotopes, Manganese radioisotopes, Nickel radioisotopes, Copper radioisotopes, Antimony radioisotopes, Aluminum radioisotopes. Chromium radioisotopes. radioisotopes, Chromium radioisotopes, Vanadium radioisotopes, Vanadioisotopes, Vanadium radioisotopes, Vanadium radioisotopes, Vanadioisotopes, Vanadium radioisotopes, Vanad

The separation of bromine-80 and mercury-197 from activated urine samples was used to demonstrate the use of brominated and iodinated resins in radiochemical separations of bromide, iodide, mercuric, and gold ions from interfering radioisotopes produced by the neutron activation of various matrices. The retention capabilities of the resins were tested using the aqueous solutions of 31 selected ions. On iodinated resins, iodide, mercuric, and gold ions were almost completely retained on the resin while the silver ion was retained up to 95 percent. Three to four 1-ml washings with water almost totally eluted all other ions except iodide, mercuric, gold, and silver. Bro-mide, mercuric, and gold ions were almost completely retained on the brominated resins, whereas about 14 percent of silver could be eluted The retention of silver was not reproducible on either resin. Additional experiments were performed to determine the effect of pH and ion con-centrations on resin retention. The retention of iodide and bromide ions by iodinated and brominated resins, respectively, was independent of pH. The retention of bromide, iodide, gold, and mercuric ions was also independent of ion concentrations in the 200 ng - 2 mg range. In the irradiated urine samples, 96 percent of the bromine-80 was retained if 0.1 ml samples were passed through the resin columns, with retention decreasing per increase in volume of urine analyzed. Accurate measurements of the 68-77 Kev peak of mercury-197 using a NaI (Tl) detector was possible by passing the urine specimen through an iodinated resin column which selectively retains mercury. (Jefferis-Battelle)

APPLICATIONS OF INFRARED SPECTROSCO-MEDICINE,
New York Medical Coll., N.Y., Dept. of

Biochemistry. F. S. Parker

Plenum Press, New York, New York, 1971, 601 p.

Descriptors: *Spectroscopy, Biochemistry, Descriptors: *Spectroscopy, Biochemistry, *Pathology, Water analyses, Spectrophotometry, Infrared radiation, Aqueous solutions, Viruses, Microbiology, Pesticides, Information retrieval, Calibrations, *Carbohydrates, *Lipids, *Amino acids, Ethers, Phosphorus compounds, *Proteins, Hydrogen, Deuterium, *Enzymes, Urine, Monitoring, Membranes, Herbicides, Metabolism, Computer programs, Automation, Antibiotics (Pesticides), Fungi, Bacteria, Water analysis, Organic carbon, Chlorophyll, E. coli. Identifiers: *Infrared spectroscopy, DNA, RNA, *Amides, *Esters, Glycerols, Diols, Cholesterol, Amides, Esters, Glycerois, Diols, Cholesteroi, Leuthins, Data interpretation, Cephalins, Phospholipids, Phosphonic acids, Phosphonates, Phosphonolipids, Plasmologens, Prostglardins, Erythrocyte, Tissue, *Peptides, Chelate compounds, Hydrogen-deuterium exchange, "Nucleic acids, "Steroids, "Porphyrins, "Drugs, Sulfona-mides, Alkaloids, Barbituates, Ureids, Amphetamines, Gas-liquid chromatography, Blood, Serum, Biological samples, Infrared spec-

The use of infrared spectroscopy is described for analysis of carbohydrates, lipids, amides, amino acids, proteins and polypeptides, nucleic acids, steroids, porphyrins, enzymes, and drugs and pharmaceuticals. Discussions are also included on the application of the method for identification study of microbiological organisms, such as Aerobacter, Acetobacter, Acetomonas, Aspergillus, Bacillus, Klebsiella, Brucellae, Pseudomonas, Vibrio, study of viruses, and analysis of blood and other biological materials. Sampling, sample preparation, interpretation of spectra, and the theory of infrared spectroscopy also are discussed. (Mortland-Battelle)

BENTHIC ALGAL COMMUNITIES OF THE

METOLIUS RIVER, Oregon State Univ., Corvallis. B. J. Sherman, and H. K. Phinney. Journal of Phycology, Vol. 7, No. 4, p 269-273, December 1971. 1 fig, 1 tab, 10 ref.

Descriptors: *Algae, *Benthic flora, *Oregon, Rivers, Biological communities, Diatoms, *Light, Solar Seasonal, *Photoperiodism, Periphyton, *Benthos. Identifiers: *Cladophora, *Achnanthes, *Spirogyra, Clodophora glomerata, *Metolius River (Ore).

Benthic algae in the Metolius River (Oregon) were sampled at regular intervals over a nearly 1-year period to determine causal facotrs in the occurrence and distribution of algae species. This river is practically free of seasonal changes in current, turbidity, dissolved substance, and temperature. Thus photoperiod and total light energy are the only variable environmental factors to be considered. Three genera, Clodophora, Achnanthes, and Spirogyra, predominated throughout the year. Cladaphora glomerata was the most abundant filamentous species. It decreased at one station during winter months when less light was available, indicating its dependence on abundant light. Other species were present only at certain times of the year, attributed also to change in available solar radiation. However, of approximately 60 species of algae identified, only 9 showed a definite seasonal distribution. The presence of relatively Cladophora glomerata. (Mortland-Battelle)
W72-07901

TESTS FOR SYSTEMATIC ERRORS IN ANAL-

YSIS, (IN GERMAN), Badische Anilin- and Soda-Fabrik A.G., Lud-wigshafen am Rhein (West Germany). For primary bibliographic entry see Field 07A. W72-07902

DETERMINATION OF TRACES OF THALLIUM BY FLUORIMETRIC TITRATION,

Laboratorium voor Analytische Scheikunde, Amsterdam (Netherlands).

sterdam (Netherlands). F. H. P. Koning, G. den Boef, and H. Poppe. Zeitschrift fur Analytische Chemie, Vol. 256, No. 4, p 270-273, October 15, 1971. 3 fig, 3 tab, 6 ref.

Descriptors: *Fluorometry, *Trace elements, *Volumetric analysis, Urine, *Fluorescence, Separation techniques, Reduction (Chemical).

Identifiers: *Thallium, *Spectrofluorimeters, Precision, *Fluorimetric titration, Chemical inter-ference, Detection limits.

The fluorescence of monovalent thallium in hydrochloric acid solution was the basis for quantitative determination of thallium (0.00001 M and lower) by a titrimetric method. Fluorimetric titralower) by a litrimetric method. Fluorimetric litra-tion was carried out by reduction of thallium (III) with tin (II) in a solution of 3.3 M HC1 and 0.8MKC1; thallium (I) shows strong fluorescence in that solution. The excitation wavelength was 253 nm, and the fluorescence wavelength, 438 nm. In a study of the influence of other metal ions on thallium determination, it was found that 10 micro-grams of thallium could be determined in the grams of thainum could be determined in the presence of limited quantities of Cu (II), Pb (II), Mo (V), Bi (III), Ca (III), and In (III). Extraction of thailium with 6M HCl was deemed not suitable since many other metals are also extracted. The best choices are 2M HBr or 2M HCl. Titration with fluorimetric end-point detection results in better selectivity and precision with very little inter-ference by temperature fluctuations and fluorescing compounds, as compared to methods based on calibration curves. Traces of thallium down to one microgram can be determined with good precision, and the method can be used to determine thallium urine at the ppm level. (Mortland-Battelle)

ANALYTICAL STUDY OF A CADMIUM ION--SELECTIVE CERAMIC MEMBRANE ELEC-TRODE, Matsushita Electric Industrial Co. Ltd., Osaka

(Japan). Wireless Research Lab. H. Hirata, and K. Higashiyama.

Zeitshcrift fur Analytische Chemie, Vol. 257, No. 2, p 104-107, December 10, 1971. 5 fig, 4 ref.

Descriptors: *Ions, *Cadmium, *Analytical techniques, Laboratory equipment, Copper, Alkali metals, Alkaline earth metals, Cobalt, Nitrates, Manganese, Lead, Zinc, Aluminum, Sulfides, Instrumentation, Water temperature, Nickel, Metals, Mechanical properties, *Membrane processes.

Identifiers: *Membrane electrodes, *Ion selective electrodes, Silver, *Ionic interference, Selectivity, Potentiometric analysis, Detection limits, Ceramic membranes, Cadmium sulfide, Perchlorato

A cadmium ion-selective membrane electrode has been developed by applying a hot-pressing method. The membrane contains cadmium sulphide, silver sulphide, and copper (I)-sulphide. The best repsonse was obtained with a membrane containing less than 30 percent of copper (I) sulphide and more than 5 percent of cadmium sulphide. The Nernstian slope was secured over an activity range of 0.1 M - 1 micro M and potentiometric analysis could be carried out over a constitution was a followed. centration range of 0.1 M - 0.1 micro M. The potentials were maintained at constant values over more than 6 months. Also, the potentials satisfied the Nernst's factor 2.303 RT/2F at the temperature range between 0 and 95 C. Among the common ions, silver, copper (II), iron (III), mercury (II), sulphide, and iodide ions interfered seriously. However, about 10-100 times of lead and bromide kaline earth metal, zinc, aluminum, nickel, cobalt, manganese (II), perchlorate, and nitrate ions did not interfere at all. (Mackan-Battelle) W72-07904

UTILIZATION OF ACTIVATION ANALYSIS AS A DETECTION TECHNIQUE FOR MERCURY, Interuniversitair Reactor Instituut, Delft (Nether-

lands). J. J. M. de Goeii.

Available from the National Technical Informa-tion Service as CONF 710 325-1, \$3.00 in paper copy, \$0.95 in microfiche. Paper presented to the working group 'Environmental Pollution' of the European Society of Nuclear Methods in Agricul-ture, March 18-19 1971, Mol, Belgium. 10 p, 5 fig.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants-Group 5A

Descriptors: *Neutron activation analysis, *Heavy metals, *Path of pollutants, Methodology, Pollutants, Chemical analysis, Automation, Food chains, Surface waters, Sediments, Milk, Urine, Fish, Foods, Plants, Grasses, Birds, Mammals, Plankton, Industrial wastes, Pulp wastes, Chemical wastes, Water analysis, Automatic control, Radioactivity techniques, Waste water (Pollution). Identifiers: *Mercury, *Biological samples, Organs, Tissue, Coffee, Tea, Cereals, Aspirin, Codliver oil, Human hair, Rhine River, Seaweed, Netherlands, Sample preparation.

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Personnel at the Interuniversity Reactor Institute have developed an analytic system based upon destructive neutron activation which is sensitive to a wide range of mercury levels in biological samples. Samples are homogenized, sealed in a quartz ampule and irradiated. Sulfuric acid and inactive mercury are added to the sample in a distillation vessel and heated to produce a clear fluid. The mercury content is volatilized by adding hydrogen bromide. The resultant mercury bromide is trapped in a solution of sodium acetate. After distillation, an inactive mercury droplet is added trapped in a solution of sodium acetate. After distillation, an inactive mercury droplet is added and the mixture is stirred for one hour. The solution is passed through a sintered glass filter from which the mercury is washed and dissolved in nitric acid. The activity measurements are made on this solution. The procedure was simplified such that separation could be carried out by an automated apparatus. An automated device was built which sould specess exist samples rightly could be considered. tomated apparatus. An automated device was built which could process six samples simultaneously. This analytic system has a sensitivity of 1.0-0.1 nanograms of mercury for all kinds of solid biological samples as well as blood and urine. The mercury levels in the chain, sediments-grass-cowmilk, were studied in relation to the Rhine River and adjacent grasslands. The levels of mercury were tabulated for each segment of the chain and it was shown that cumulative effects were absent. The highest level of mercury was found in dry sediments (2000-9000 ppb) and the least in milk (ca.0.3 ppb). (Holoman-Battelle) W72-07908

DESIGN STUDIES FOR A BIOMEDICAL GAS CHROMATOGRAPH,
Baylor Coll. of Medicine, Houston, Tex. Inst. for

Lipid Research. E. C. Horning, C. D. Pfaffenberger, and A. C.

Moffat. Analytical Chemistry, Vol. 44, No. 1, p 2-8, 7 fig, 5

ref, January 4, 1972. Descriptors: *Gas chromatography, *Design, Laboratory equipment, *Chromatography, Instru-mentation, *Analytical techniques, Separation

techniques. Identifiers: *N-alkanes, Backflushing, Biological

An instrument was constructed for the purpose of studying the parameters involved in the design of a new gas chromatographic separation system. The immediate objective was to determine the feasi-bility of operation of a 2 column GC instrument, bility of operation of a 2 column GC instrument, and to study the relationship between operation and design. Three stages are involved in the gas phase process: separation of solvent (s), reagent (s), and all compounds with MU value up to a point predetermined by the separation conditions; backflush transfer of the sample to be analyzed to an analytical column; and analytical separation of sample components by isothermal or temperature programming techniques. The separation of function of the usual GC column into two serial functions permits reconsideration of most of the elements of design which limit the performance and ments of design which limit the performance and usefulness of present day gas chromatographs in biologic and medical studies. The sample materials used were solutions of n-alkanes in toluene. (Mackan-Battelle) W72-07909

NEW POSSIBILITIES OF ANALYSIS BY COM-BINATION OF DIRECT QUANTITATIVE THIN-

-LAYER CHROMATOGRAPHY AND ELEC-TRONIC DATA PROCESSING, (IN GERMAÑ), Schering A.G., Bergkamen (West Germany). Zen-trale Analytik Werk Wolfenbuttel.

Zeitschrift fur Analytische Chemie, Vol. 256, No. 1, p 20-24, 4 tab, 10 ref, August 31, 1971. English summary.

Descriptors: *Pesticides, *Chromatography, *Computer programs, Automation, Data processing, Analytical techniques. Identifiers: *Thin-layer chromatography, Data interpretation, Method evaluation, Graphical analy-

A computer program for direct evaluation of thin-layer chromatograms has been tested with a laboratory and some technical formulations of a pesticide. Results have been compared with those obtained by two conventional methods. Mean rela-tive standard devices as leveled for obtained by two conventional methods. Mean relative standard deviation calculated from results compiled by electronic data processing (method A) is about 6 percent, compared to 10 percent received by the graphic method (method C) which is employed by most investigators. In addition, overall time of analysis is 34 percent higher if the graphic method is used. Method A saves time and expense especially in routine analysis because working of the process is easier and may be performed even by assistant personnel. The proposed method is suitable for the determination of different active ingredients and impurities even in difficult technical products. (Mortland-Battelle)

MINOR ELEMENTS IN ILLINOIS SURFACE

Illinois Water Survey Technical Letter 14, November 1971. 2 p, 2 tab.

Descriptors: *Trace elements, *Water analysis, Surface waters, *Illinois, Chemical analysis, Data collections, Sampling, Laboratory tests, Water chemistry, Heavy metals, Water quality, Streams, *Cadmium, *Chromium, *Copper, *Lead, Nickel, Strontium, Zinc.

Identifiers: Minor elements, Illinois streams,

The concentrations of eight minor elements observed in samples taken from Illinois streams between 1966 and 1971 are tabulated. The elements are cadmium, chromium, copper, lithium, lead, nickel, strontium, and zinc. The data were analyzed on an equal to or less than basis; cumula-tive percentage distributions, or relative frequency of occurrence of levels equal to, or less than, the given specific concentrations in mg/liter are shown. The observed maximum concentrations, in mg/liter, for eight elements at 27 sampling stations are listed. All of these minor elements are widely distributed in low concentrations throughout sur-face waters of the state. Although total chromium reached 0.05 mg/liter in the Des Plaines River, this occurred only once and the average concentration was less than 0.005 mg/liter. The same is true for cadmium in both the Kankakee River and Henderson Creek where single cadmium concentrations exceeding 0.01 mg/liter were found but the average was less than 0.005 mg/liter. (Woodard-USGS)

DETERMINATION OF TOTAL RARE-EARTH CONTENT IN NATURAL WATERS BY EXTRACTION-SPECTROPHOTOMETRY METHOD (EXCHANGE OF EXPERIENCE), Inkutskii Gosudarstvennyi Universitet (USSR); and Akademiya Nauk URSR, Kiev. Institut Obshchei i Neorganicheskoi Khimii.

Obstacher Nedgantineson Rimina.
N. S. Poluektov, A. I. Kirillov, O. P. Makarenko, and N. A. Vlasov.
Zavodskaya Laboratoriya, Vol 37, No 5, p 680-681, May 1971. 1 fig, 1 tab, 8 ref. Trans. from Zavodskaya Laboratoriya, Vol 37, No 5, p 536-537

Descriptors: *Water analysis, *Spectrophotometry, *Separation techniques, *Trace elements, Chemical analysis, Optical properties, Ions, Heavy metals.
Identifiers: *Rare earth elements, Complex compounds, Chemical interference, Thiocyanate, Lanthanum, Cerium, Praseodynium, Neodymium, Promethium, Samarium, Europium, Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Thulium, Yiterbium, Lutetium.

An extraction spectrophotometry method employing arsenazo III and diphenylguanidiae ternary complexes (DPG) in butyl alcohol was developed for determining the sum of rare-earth elements in natural waters. Interference from other ions (UO2 (++), Th (4+), Zr (4+), Hf (4+), Bi (3+), C20 (++), Mg (++), Pb (++)) was eliminated by preliminary extraction. The method developed is as follows: A 20-ml aliquot portion of the investigated solution is place in a separating funnel; 1 ml of 5 M NH4CNS is added; the pH is adjusted to 0.5-1.0; and the solution is extracted with 10 ml to 0.5-1.0; and the solution is extracted with 10 ml of 0.1 M solutions of diantipyrylmethane in chloroform; the extract is discarded. Three 5-ml chloroform; the extract is discarded. Three 5-ml portions are taken from the aqueous phase and placed in separating funnels. Into each funnel are added 1 ml of 0.001 M arsenazo III solution, 1.5-2 ml of DPG solution, and 2 ml of a buffer solution (pH 4.0). Into two of the separating funnels is added a standard solution containing 1-10 micrograms of rare-earth elements. The volume is made up to 10 ml, and the solutions are extracted with 5 ml of a buttle deced in up to 10 ml, and the solutions are extracted with 5 ml of n-butyl alcohol. The extracts are placed in quartz cells (1 = 1 cm). The optical density of the samples is then determined with a spectrophotometer at maximum absorption (656 microns). The total content of rare-earth elements is calculated by known methods. (Jefferis-Battelle) W72.07091

SEPARATION OF NORMAL PARAFFINS FROM KEROSENE - GAS OIL FRACTIONS BY

FROM KEROSENE - GAS OIL FRACTIONS BY SYNTHETIC ZEOLITES, Groznenskii Neftyanoi Institut (USSR).
N. F. Meged', Ya. V. Mirskii, A. Z.
Dorogochinskii, and L. V. Borisova.
Khimiya i Technologiya Topliv i Masel, Vol. 7,
Nos. 5-6, p 405-408, May-June 1971. Trans from
Khimiya i Tekhnologiya Topliv i Masel, No 6, p 61 lune 1971. 9. June 1971.

Descriptors: *Oil, Fuels, *Zeolites, Detergents, Analytical techniques, Industrial production, Separation techniques.

Separation techniques:

Neparations, Kerosene, Gas oil, Steam, N-hexane, Nitrogen, Adsorption, Resorption, Petroleum processing, Fractionation, Aromatic hydrocarbons, Hydrocarbons, Desorbents, Paraffins, Hexane.

A technique to improve the supply of n-paraffins from kerosene-gas oil fractions using synthetic molecular films (zeolites) is presented, with pilot plant flow sheet and feedstock characteristics in-cluded. The n-paraffin contents in the feedstock, the denormalization fraction, and the n-paraffin concentrate were determined by a pycnometric method using molecular sieves and chromatograph analysis. A study of the relative efficiency of steam, n-hexane and nitrogen as desorbents showed that steam is the most effective for C10showed that steam is the most effective for C10-C16 n-paraffins. The separation is accomplished from a 170-270 degrees C fraction in a fluidized bed of MgA zeolite. The steam process is effective at 400 degrees C and Atmospheric Pressure, with an effective capacity of 2 wt. percent for a desorbent input of 2 parts by weight to 1 part by weight of the n-paraffins desorbed. N-paraffins of 99 percent purity with an aromatic hydrocarbon content up to 1 wt. percent can be obtained. (Mackan-Battelle) W72-07992

HIGH-QUALITY BASES FOR CONDENSED LUBRICANTS DERIVED FROM LOW-MOLEC-

Group 5A—Identification of Pollutants

ULAR OILS FROM SECONDARY REFINING

PROCESSES, E. G. Semenido, V. V. Nikitin, N. V. Shchegolev, S. I. Stepuro, and V. I. Karzhev.

Khimiya i Technologiya Topliv i Masel, Vol. 7, Nos. 5-6, p 444-447, May-June 1971. 6 tab. Trans from Khimiya i Tekhnologiya Topliv i Masel, No 6, p 38-41, June 1971.

Descriptors: *Oil, *Distillation, Lubricants, Viscosity, Temperature, Condensation. Identifiers: *Oil characterization, Paraffin, Hydrocracking, Hydroisomerization, Polymers, Oil processing.

Aviation lubricants are derived from low-molecular oil bases directly distilled from crude petrole-um. The quality of aviation lubricants derived from low-molecular oil bases depends upon that of the raw material and the extent of refining. Although some materials are superior to others, there is little potential for improving the quality of directly distilled oil bases. On the other hand, lowmolecular oil bases from secondary conversion show considerable potential and have good physiochemical properties and operating characteristics. Characteristics of three such oil bases are presented and the results of tests using these oils are discussed. The three were: products of hydrocracking and hydroisomerization of petrolatum; products of hydroisomerization of paraffins and crudes; and filtrates of paraffin production. It has been shown that the condensing behavior of the polymer additions used in these oil bases is not significantly affected by the nature of the base. Further tests demonstrated that the nature of the base does not markedly influence the mechanical destruction of the polymer. It is also shown that the nature of the oil base very markedly influences viscosity-temperature properties after condensation by means of polymer additions. (Mortland-Battelle) W72-07993

INVESTIGATION OF THE CONCENTRATION OF THE EXTRACT DURING THE EXTRAC-TION OF AROMATIC HYDROCARBONS BY 1--NITRO-2-METHYLPROPANOL-2 ROTATING RING COLUMN,

Kazan Inst. of Chemical Technology (USSR). I. N. Diyarov, L. M. Kozlov, V. N. Doronin, and R. R. Bureeva.

Khimiya i Technologiya Topliv i Masel, Vol. 7, Nos. 5-6, p 414-416, May-June 1971. i tab, 2 ref. Trans from Khimiya i Tekhnologiya Topliv i Masel, No 6, p 13-14 June 1971.

Descriptors: *Chemical analysis, *Separation techniques, Chromatography, Organic comnounds.

Identifiers: *Aromatic hydrocarbons, *Organic nitrogen compounds, Benzene, Toluene, Isooctane, Heptane, 1-Nitro-2-methylpropanol-2, Or-

Data are presented from an investigation of the concentration of aromatic hydrocarbons in ex-tracts obtained by supplying pure aromatic hydrocarbons as recycle. The aromatic hydrocarbons were recovered and concentrated in a rotating ring column 640 mm high and 23 mm internal diameter. The height of the extract enrichment zone was approximately 130 mm, and the height of the refined extract purification zone 350 mm. Using benzene as recycle, a four-component mixture containing 34 percent aromatic hydrocarbons was chromatographically analyzed for extraction products. Recovery of benzene ranged from 98 to 100 percent by volume. The data show that by extracting the aromatic hydrocarbons with 1-nitro-2 methylpropanol-2 and increasing the recycle feed, the aromatic extract becomes more concentrated. but recovery of the aromatic hydrocarbons remains about the same. Under the conditions stu-died, the water content of the solvent and the solvent-to-raw-material ratio had an insignificant effect on the composition of the extract. Depending on the hydrocarbon mixture used, it was possible

to obtain extracts containing up to 99 percent aromatic hydrocarbons as verified by tabular data. (Jefferis-Battelle)

OXIDATION OF HYDROCARBONS -ECONOMIC WAY TO PETROCHEMICAL PRODUCTS, PRODUCE Vsesoyuznyi Nauchno-Issledovatelskii Institut Neftekhimicheskikh Protsessov, Leningrad

B. L. Moldavskii, and V. K. Tsyskovskii. Khimiya i Technologiya Topliv i Masel, Vol. 7, Nos. 5-6, p 409-413, May-June 1971. 65 ref. Trans. from Khimiya i Tekhnologiya Topliv i Masel, No. 6 p. 9-12, June 1971.

Descriptors: *Oxidation, *Organic compounds,

Aromatic compounds.
Identifiers: *Hydrocarbons, Identifiers: "Hydrocarbons, "Petrochemical synthesis, "Ozonolysis, Vapor-phase catalytic oxidation, Olefins, Buto-hydrocarbons, Alkanes, Aliphatic hydrocarbons, Aromatic hydrocarbons, Oil processing.

Investigations at the All-Union Scientific Research Institute of Petrochemical Processes directed toward applying the reactions of the tion and ozonolysis of various compounds are tion and ozonolysis of various compounds are tion and ozonolysis included vapor-phase oxidareviewed. The studies included vapor-phase oxida-tion of aromatic and unsaturated hydrocarbons; production of maleic and patholic anhydrides from petroleum gases by oxidation of C 4 hydrocar-bons; development of varadium-potassium-sulfate catalyst; investigations of catalytic phenomena; development of a hypothesis of the decomposition of secondary alkyl hydroperoxides; oxidative conversion of n-alkanes, oxidation of narrow gasoline fractions in the liquid phase development of principles of the distribution of oxidation products formed during the cleanage of C-C bonds during the oxidation of methyl esters, aliphatic acids, acetates of alcohols, and diesters of dicarboxylic acid; products of ozonization of unsaturated compounds; and effects of temperature and solvents on reaction rates during ozonization. (Holoman-Battelle) W72-07995

MODIFICATIONS OF THE MICROMETHOD OF SAMPLE CLEANUP FOR THIN-LAYER
AND GAS CHROMATOGRAPHIC SEPARATION AND DETERMINATION OF COMMON ORGANIC PESTICIDE RESIDUES,

Kansas State Univ., Manhattan. Dept. of En-A. M. Kadoum.

Bulletin of Environmental Contamination and Toxicology, Vol. 3, No. 6, p 354-359, 1968. 2 tab, 4 ref. OWRR B-007-KAN (4).

Descriptors: *Gas chromatography, *Pesticides, Analytical techniques, Insecticides, Aldrin, Diel-drin, Endrin, Heptachlor, DDT, DDD, DDE, *Pesticide residues, *Pollutant identification. Identifiers: *Thin-layer chromatography, Ovex, Perthane, Telodrin, Kelthane, Silica Gel.

Success in the cleanup of microquantities of pesticides in ground water, soil, plant and animal tissue extracts for gas-liquid chromatography has been achieved using a rapid microcolumn method. However, the microcolumn cleanup method has limited the size of samples that can be processed for analysis. The micromethod using high purity grade 950 silica gel has been extended to include high purity grade 923 silica gel (100-200 mesh) and has been modified for the cleanup of 5-100 gram samples for thin-layer and gas chromatographic analysis. The TLC technique of Walker and Beroza was used for detection of pesticide residues with the following minor variations. Silica gel G plates were washed with 1% hydrogen peroxide in redistilled acetone, then reactivated in vertical position for 1 hr at 120 C prior to use. Five minutes after development the plate was sprayed with 1% hydrogen peroxide in redistilled

acetone, dried and then sprayed with fluorescein solution, exposed to ultraviolet light for 5 min, sprayed with silver nitrate solution, and finally exposed to ultraviolet light for 5 min. R sub f values were recorded throughout the procedure. (Svensson-Washington) W72-08064

INFESTATION OF BENTHIC CRUSTACES, FISH EGGS, AND TROPICAL ALGAE, Rhode Island Univ., Kingston. Dept. of Bac-teriology and Biophysics. For primary bibliographic entry see Field 05C. W72-08142

SPECIES DIVERSITY OF NET ZOOPLANKTON AND PHYSIOCHEMICAL CONDITIONS IN KEYSTONE RESERVOIR, OKLAHOMA, Wisconsin State Univ., Superior. Dept. of Biology. K. A. Kochsiek, J. L. Wilhm, and R. Morrison. Ecology, Vol. 52, No. 6, p 1119-1125, Autumn 1971. 2 fig, 5 tab, 14 ref.

Descriptors: *Zooplankton, *Physicochemical properties, *Density, *Measurement, Reservoirs, Rivers, Systematics, Statistical methods, Benthic fauna, Dams, Rotifers, Copepods, Crustaceans,
*Oklahoma, Turbidity, Alkalinity, Temperature,
Dissolved oxygen, Chemical analysis, Water analysis, Conductivity, Daphnia, Water quality, Aquatic population.

Identifiers: *Keystone Reservoir, *Species diversity, Cimarron River, Arkansas River, Salt Creek, Macroinvertebrates, Data interpretation, Species diversity index, Biological samples, Cladocera,

Net zooplankton collections and physicochemical measurements were made monthly at four sampling sites each in the Cimarron River and Arkansas River arms and one site at the dam of Keystone Reservoir, Oklahoma, from 21 June 1967 to 24 June 1968. The purpose was to (1) estimate statistical variation among replicate samples of species diversity indices (d-bar) from various sample sizes, (2) observe monthly and longitudinal trends in physicochemical conditons and in species diversity of zooplankton in a reservoir, and (3) determine the correlation between species diversi-ty and measured physicochemical parameters. Conductivity was considerably greater in the Cimarron Arm than in the Arkansas Arm or at the dam, while turbidity, alkalinity, and zooplankton density were generally higher in the Arkansas arm. Variation among stations in temperature and dissolved oxygen was slight. A total of 44 taxa of zooplankton were collected. Shannon's formula was used to evaluate species diversity of zooplankton. Variance values of the diversity indices indicated only a slight gain in precision by increasing the sample size to above 400 individuals. Mean annual species diversity was slightly lower in the Cimarron Arm than in the Arkansas Arm. Diversity values decreased slightly through early winter and decreased abruptly and reached minimum values in late winter and early spring. Coefficients of correlation between physicochemical parameters and species diversity unadjusted for month and station effect were compared with adjusted coefficients. It was found that the adjusted coefficients more adequately expressed the relationship between physicochemical parameters and diversity. (Holoman-Battelle)

GRAPHICAL INTERPRETATION OF WATER--QUALTIY DATA, Wisconsin Univ., Madison. Dept. of Geology and

Geophysics. For primary bibliographic entry see Field 02K.

W72-08183

FACTORS AFFECTING THE VALIDITY OF CHEMICAL ANALYSES OF NATURAL

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New Mexico Inst. of Mining and Technology. Socorro. For primary bibliographic entry see Field 02K. W72-08185

RADIOACTIVE SEDIMENT TRACER TESTS, CAPE FEAR RIVER, NORTH CAROLINA, Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 05B. W72-08232

THE USE OF RADIOISOTOPES IN SEDIMENT TRANSPORT STUDIES, Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 05B. W72-08234

PRELIMINARY DATA CONCERNING THE USE OF ARTIFICIAL SUBSTRATA FOR THE ECOLOGICAL STUDY OF PERIPHYTON AND FOR THE IDENTIFICATION OF ENVIRONMENTAL RADIOACTIVITY IN A RUNNING-WATER ECOSYSTEM,

Milan Univ. (Italy). For primary bibliographic entry see Field 05B. W72-08235

ANALYTICAL METHODS IN OCEANOG-RAPHY. I. INORGANIC METHODS, Woods Hole Oceanographic Institution, Mass. W. D. Spencer, and P. G. Brewer. CRC Critical Reviews in Solid State Sciences, Vol 1: p 409-478, Sept 1970. 9 fig, 7 tab, 332 ref.

Descriptors: *Oceanography, *Hydrologic aspects, *Radioisotopes, *Radioactivity techniques, *Radiochemical analysis, Measurement, Strontium, Cesium, Tritium, Uranium, Thorium, Carbon, Sampling, Storage, Water analysis, *Reviews.

The sea is a very complex mixture of many different components. Every natural element has been detected in sea water and, since the time of the origin of life, the ocean has accumulated a tremendously complex spectrum of organic constituents, parts of which are constantly changing with time scales of seconds to thousands of years. A very great variety of analytical techniques has been applied to the detection of individual chemi-cal species. Given is an informative account of current methods, their strengths and weaknesses, together with some new techniques that hold promise for the future. The discussion is confined to inorganic aspects; organic chemical methods will be covered in a later review. (Houser-ORNL) W72-08239

TRACE SUBSTANCES IN RAIN WATER: CON-CENTRATION VARIATIONS DURING CON-VECTIVE RAINS, AND THEIR INTERPRETA-

TION, Michigan Univ., Ann Arbor. Dept. of Meteorology

and Oceanography.

D. F. Gatz, and A. Dingle.

Tellus, Vol 23, No 1, p 14-27, 1971. 9 fig, 3 tab, 33 ref. Contract AEC AT (11-1)-1407.

Descriptors: *Precipitation (Atmospheric), *Rain water, *Radioactivity, *Soil contamination, *Water pollution sources, Rainfall disposition, Rainfall intensity, Background radiation, Air pollution, Spores, Pollen. Identifiers: Concentration, Beta radiation.

The temporal changes of contaminant concentrations in rain water samples collected sequentially at a fixed point are dependent upon both the rain scavenging and drop growth processes and the advective effects of the motion field upon the scalar field of concentration variations in the rain cloud. The observations that rainfall intensity and contaminant concentrations are usually negatively correlated, but occasionally for short periods are positively correlated, are explained. Periods of positive correlation appear mainly because of a predominating advective effect, whereas, all drop growth and scavening processes operate to predominating advective effect, whereas, all drop growth and scavenging processes operate to produce the negative correlation. In the massive storms characterized by Browning (1964) as 'Storms' and by Newton (1966) as 'persistent,' an extraordinarily well-organized downdraft is inferred. The strong evaporative effect of this downdraft upon rain in contact with it produces an atypical variation of concentrations in relation to existent the store of the interest of the storest of the rainfall rates. An example of this is presented. Rainfall rate, pollen and beta radioactivity concentration profiles are given. (Houser-ORNL) W72-08240

RELATIONSHIPS OF SALMONELLAE TO FECAL COLIFORMS IN BOTTOM SEDI-MENTS,

Environmental Protection Agency, Cincinnati, Ohio. Div. of Water Hygiene. For primary bibliographic entry see Field 05B. W72-08301

CHARACTERIZATION OF WASTE TREAT-MENT PROPERTIES OF PIG MANURE, Newcastle-upon-Tyne Univ. (England). Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05G. W72-08303

THE USE OF FLUORESCENT ANTIBODY TECHNIQUES FOR DETECTION OF STREPTOCOCCUS FAECALIS AS AN INDICATOR OF FECAL POLLUTION OF WATER, North Texas State Univ., Denton. Dept. of Biological Sciences; and Clemson Univ., S.C. Dept. of leaf sciences, and change of the property of t

Descriptors: *Testing procedures, *Sampling, *Indicators, Streptococcus, Fluorescence, Water quality, Sewage effluents, Runoff, Water pollution sources, Bacteria, Pollutant identification. Identifiers: *Fecal pollution, Streptococcus Faecalis, *Bacterial indicators.

A slide method for use of fluorescent antibody identification of Streptococcus faecalis is described. This method permits S. faecalis of fecal origin to be distinguished from those soil and water forms which are able to reproduce in water and sewage. Reactions were specific as confirmed by biochemical tests. Non-specific cross species fluorescence was readily removed by adsorption. Results indicate that this technique provides a method which will be useful in those pollution studies which require rapid identification and quantitation of organisms indicating fecal pollution. (Dorland-lowa State) W72-08304

A STUDY OF ORGANIC CARBON-BOD RELA-TIONSHIPS IN DILUTE DOMESTIC WASTE-

WATER, Virginia Polytechnic Inst. and State Univ., Blacksburg. For primary bibliographic entry see Field 05B. W72-08374

THE PHASE-SEPARATION METHOD FOR THE CONCENTRATION AND DETECTION OF VIRUSES IN WATER, Hadassah Medical School, Jerusalem (Israel). H. I. Shuval, B. Fattal, S. Cymbalista, and N.

Water Research, Vol 3, p 225-240, 1969, 1 fig, 8 tab, 18 ref. HEW Agreement BSS-CDC-15-10.

Descriptors: "Viruses, "Public health, "Separation techniques, Analytical techniques, Laboratory tests, Potable water, Isolation, Monitoring, Waste water treatment, Water quality control, Pollutant identification.

Identifiers: "Phase-separation method, Organic

A water sample of several liters to be tested for viruses is mixed with a combination of organic polymers, which, after detention in a separatory funnel, produce two phases. The small bottom phase contains the viruses, and this phase is drawn off and the procedure repeated if greater accuracy is required. The median physical concentration factor achieved was 173 for the first step and 520 for the full two step procedure. Median recovery efficiency was 87% in water and 134% in sewage, with one possible explanation of the apparent recovery of higher viral populations than were seeded being the 1.0 M NaCl concentration to which the viruses are exposed during phase separation. Experiments indicate that virus counts increase with increasing diluent molarity in the range 0.15 M to 1.0 M. Data indicate that 1-2 plaque forming units of viral contamination will be detected approximately 85% of the time. Viruses were detected, using the phase separation methods, in most field samples of sewage, some streams, and some wells. 176 strains of virus were identified with as many as four strains found in a single sample. The Phase-Separation Method was also used successfully in the quantitative evaluation of the removal of natural virus flora in wastewater treatment systems. (Lowry-Texas) W72-08382

LIMNOLOGICAL DATA FROM LAKE ST. CLAIR, 1963 AND 1965, National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab. For primary bibliographic entry see Field 02H. W72-08415

CONDUCTIMETRIC DETERMINATION OF ACTIVITY COEFFICIENTS: ALKALI METAL NITRATES, BROMATES, AND IODATES IN WATER AT 25 DEG. C. (DETERMINATION CONDUCTIMETRIQUE DES COEFFICIENTS D'ACTIVITE: SELS ALCALINS A ANIONS OXYGEN ES DANS L'EAU A 25 DEG C, Paris Univ. (France). Laboratoire d'Electrochimie. For primary bibliographic entry see Field 02K. W72-08435

METHOD RESEARCH STUDY 3, DEMAND ANALYSES - AN EVALUATION OF ANALYTI-CAL METHODS FOR WATER AND WASTE-

WATER,
National Environmental Research Center, Cincinnati, Ohio, Analytical Quality Control Lab.

EPA Report, 1971, 32 p, 1 tab, 6 ref.

Descriptors: *Methodology, *Biochemical oxygen demand, *Chemical oxygen demand, *Analytical techniques, Evaluation, Water quality control, Operations research, Waste water, *Pollutant identification.

Identifiers: *Total organic carbon.

The Analytical Quality Control Laboratory of National Environmental Research Center EPA, CONDUCTED INTERLABORATORY RESEARCH STUDIES ON SELECTED CHEMICAL METHODS OF ANALYSIS FOR CHEMICAL OXYGEN DEMAND (COD), total organic carbon (TOC) and for biochemical oxygen demand (BOD). Sample concentrates were prepared at low (national water) levels and at higher (municipal waste) levels for each constituent. An aliquot of each concentrate was added to distilled water for COD and TOC analyses and to a natural water of the analyst's choice for BOD analyses. Single analyses were made on the analyses. Single analyses were made on the distilled and natural water samples with and

Group 5A—Identification of Pollutants

without added increments. Recoveries were compared. The bias of the method and, where possi-ble, the interference of natural water samples and the relative precision of each analyst and laboratory were determined. A statistical summary of these data showed that the three methods had similar precision and accuracy. In addition, it was found that ratios between COD, BOD, and/or TOC can be developed easily for these sets of data for single samples. However, the ratios are not applicable to any other sample. Therefore, it is not possible to determine oxygen demand by measur-ing one of these parameters, and using a predeter-mined ratio to determine relative values for the other two parameters of another sample. (Mackan-Rattelle) W72-08460

QUANTITATIVE ESTIMATION OF LOW-MOLECULAR NINHYDRIN-POSITIVE MATTER IN WATERS RICH IN AUTUMN SHED LEAVES,

Bonn Univ. (West Germany). Zoological Inst. For primary bibliographic entry see Field 05B.

ON WATER, VOL. XXXVII. AN ANNUAL FOR WATER CHEMISTRY AND WATER PURIFICA-TION TECHNIQUE, (IN GERMAN), W. Husmann.

Verlag Chemie: Weinheim/Bergstr., West Germany, 1971. English Summaries. 228 p, Illus, Mans

Identifiers: *Water chemistry, Plants, *Water purification, Desalination, Analytical methods, Chemical oxygen demand, Flocculation, Hydrogen ion concentration.

This volume includes 19 contributions discussing research and innovations in water chemistry and purification techniques. Two contributions discuss production of drinking and industrial water from the sea. Next, gas oversaturation and the effect of ozone on urea in water is discussed, followed by 2 contributions detailing the automatic and manual methods of determining organically bound carbon in water. Subsequent articles discuss catalytic influence on organic substance oxidation, chemical O2 demand, electrodes for measuring pH, conductivities and O2 concentration, the role of higher plants in the catabolism of organic matter, flocculation, economics of organic substance removal and biological treatment of waste water.--Copyright 1972, Biological Abstracts, Inc. W72-08483

5B. Sources of Pollution

STUDIES AT OYSTER BAY IN JAMAICA, WEST INDIES. V. QUALITATIVE OBSERVA-TIONS ON THE PLANKTONIC ALGAE AND PROTOZOA.

Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.; and Johns Hopkins Univ., Baltimore, Md. Dept. of Biology. R. J. Buchanan.

Bulletin of Marine Science, Vol. 21, No. 4, p 914-937, December 1971. 1 fig, 3 tab, 45 ref.

Descriptors: *Algae, *Protozoa, *Primary productivity, Invertebrates, *Plankton, *Water temperature, Systematics, Sampling, Nets, Centrifugation, Microscopy, Diatoms, Nutrients, Bacteria, Chrysophyta, Phytoplankton, Zooplankton, Pyrrophyta, Cyanophyta, Chlorophyta, Euglenophyta, Grazing, quality

Identifiers: *Oyster Bay, *Jamaica, Falmouth Harbor, *Tintinnids, *Tychopelagic, *Tempera-ture tolerances, Sample preservation, Counting chambers, Nutrient cycling.

Plankton samples were collected from Oyster Bay, Jamaica over a 15-month period to make a qualita-tive analysis of planktonic algae and protozoa. One hundred fifty-two organisms were identified from the entire collection series. Of these, 28 taxa were found to be most common and abundant. Many taxa (all of the Sarcodina and over half the Bacillariophyceae) were tychopelagic and it is suggested that these species are important in the primary production of Oyster Bay. All the ciliated protozoans identified were tintinnids, which, being planktonic, are probably significant grazers on bacteria and the smallest algae. They might also play an important role in the regeneration of nutrients in Oyster Bay. Examination of the literature on the known temperature tolerances of the 28 most common and abundant taxa showed that only Pyrodinium bahamense and Ceratium hircus were restricted to the temperature range found in Oyster Bay. This, and other evidence, indicates that Oyster Bay selects against highly specialized organisms and in favor of highly adaptable ones. (Mortland-Battelle) W72-07899

ECOLOGICAL IMPLICATIONS OF MERCURY POLLUTION IN AQUATIC SYSTEMS, Florida State Univ., Tallahassee. Dept. of Oceanography.

For primary bibliographic entry see Field 05C. W72-07906

THERMAL DISCHARGES: ECOLOGICAL EF-FECTS, Battelle Memorial Inst., Columbus, Ohio

For primary bibliographic entry see Field 05C. W72-07907

UTILIZATION OF ACTIVATION ANALYSIS AS A DETECTION TECHNIQUE FOR MERCURY, Interuniversitair Reactor Instituut, Delft (Nether-

For primary bibliographic entry see Field 05A. W72-07908

PHOTODECOMPOSITION OF CHLORINATED DIBENZO-P-DIOXINS.

California Univ., Davis. Dept. of Environmental Toxicology.

D. G. Crosby, A. S. Wong, J. R. Plimmer, and E. Science (Washington). 173 (3998): 748-749. 1971.

Descriptors: *Herbicides, *Decomposing organic matter, Chlorination.

*Chlorinated, *Photo decomposition.

The toxic herbicide impurity 2,3,7,8-tetrachlorodibenzo-p-dioxin and its homologs decomposed rapidly in alcohol solution under artificial light and natural sunlight, the rate of decomposition depending upon the degree of chlorination. However, photodecomposition was negligible in aqueous suspensions and on wet or dry soil.—Copyright 1972, Biological Abstracts, Inc. W72-07934

ATMOSPHERIC AMMONIA: ABSORPTION BY

Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div G. L. Hutchinson, R. J. Millington, and D. B. Peters.

Science, Vol 175, No 4023, p 771-772, February 18, 1972. 1 fig, 1 tab, 7 ref.

Descriptors: "Air pollution, "Ammonia, "Nitrogen, "Plant growth, Absorption, Atmospheric pressure, Plant morphology, Soilwater-plant relationships, Water pollution sources, Water pollution control, Sulfur compounds," Descriptors: *Air pollution,

pounds. Identifiers: Plant nutrition, Atmosphere decon-

Data are presented which show that plant leaves act as a natural sink for atmospheric NH3 and that estimates can be made of rates of adsorption for estimates can be made of rates of adsorption for different plant species. The data have broad implications in plant nutrition and in air-pollution and water-pollution control. By monitoring the loss of ammonia from an airstream flowing through a small growth chamber containing a single plant seedling, it was found that plant leaves absorb significant amounts of ammonia, even at naturally low atmospheric concentrations. Calculations based on the data indicate that the annual NH3 absorption by plant canonies could be about 20 kg sorption by plant canopies could be about 20 kg per hectare. Field crops growing in air containing NH3 at normal concentrations may receive as much as 10% of total nitrogen requirement by direct absorption of NH3 from the air. This supply can contribute significantly to the nitrogen budget can contribute significantly to the nitrogen outget of growing plants and exert much influence on the long-term behavior of the soil-water-plant systems. These data, with other data on the ab-sorption of atmospheric SO2 by plants, also sug-gest an important role for plants in decontamina-tion of the archive strustence of the second structure. tion of the earth's atmosphere. (Lang-USGS) W72-07959

GROUNDWATER CONTAMINATION BY ROAD SALT: STEADY-STATE CONCENTRA-TIONS IN EAST CENTRAL MASSACHUSETTS, Brandeis Univ., Waltham, Mass. Environmental Studies Program.

E. E. Huling, and T. C. Hollocher. Science, Vol 176, No 4032, p 288-190, April 21, 1972. 2 tab, 16 ref.

Descriptors: *Water pollution sources, *Mas-sachusetts, *Snow removal, *Deicers, *Saline water, Water pollution effects, Salts, Roads, Chlorides, Groundwater, Urban hydrology. Identifiers: *Road salt, Highway deicing.

The average steady-state contamination of groundwater by road salt in the suburban area around Boston, at current rates of application of salt, is about 160 milligrams of sodium chloride per liter of water. Values of 50 to 100 milligrams of chloride per liter are found commonly now in town wells in eastern Massachusetts. These salt concentrations may be of concern to persons on low-sodi-um diets and to persons who obtain water from wells in the vicinity of major highways where salt concentrations could be several times higher than average. (Knapp-USGS) W72-07962

A PRACTICAL METHOD OF DETERMINING WATER CURRENT VELOCITIES AND DIFFUSION COEFFICIENTS IN COASTAL WATERS BY REMOTE SENSING TECHNIQUES, Texas A and M Univ., College Station. Dept. of Civil Expicacy in Control College Station.

Civil Engineering. W. P. James.

W. P. James. Available from NTIS, Springfield, Va. 22151. as N72 11323. Price \$3.00 paper copy; \$0.95 in microfiche. Texas A and M University Remote Sensing Center, Technical Report RSC-34, Oc-tober 1971. 26 p, 1 fig, 29 ref. Grant No. NASA NsG 239-62-Tex Water Quality Bd Grant IAC (72-73)-156.

Descriptors: *Remote sensing, *Water pollution sources, *Surface waters, *Water circulation, *Dye dispersion, Tracking techniques, Aircraft, Estuaries, Coasts, Diffusion, Currents (Water), Water pollution control, Waste water (Pollution), Forecasting, Computer models. Identifiers: Research project.

Water current velocities and diffusion coefficients were determined from aircraft dye drops which formed dye patches in the receiving water. The changes in position and size of the patches were recorded from two flights over the area. The simplified data processing procedure requires only that the ground coordinates about the dye patches be determined at the time of each flight. With an automatic recording coordinatograph for measur-ing coordinates and a computer for processing the

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data, this technique provides a practical method of determining circulation patterns and mixing characteristics of large aquatic systems. This information is necessary to assess the environmental impact of waste water discharges and for industrial plant siting. (Woodard-USGS)

RESPONSES OF SOME ESTUARINE FISHES TO INCREASING THERMAL GRADIENTS, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Resources; and Ichthylog-ical Association, Middletown, Del. For primary bibliographic entry see Field 05C.

CADMIUM IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL AP-PRAISAL, Karolinska Institutet, Stockholm, (Sweden). Dept.

of Environmental Hygiene. For primary bibliographic entry see Field 05C.

W72-08062

MODIFICATIONS OF THE MICROMETHOD OF SAMPLE CLEANUP FOR THIN-LAYER AND GAS CHROMATOGRAPHIC SEPARA-TION AND DETERMINATION OF COMMON ORGANIC PESTICIDE RESIDUES, Kansas State Univ., Manhattan. Dept. of En-

tomology. For primary bibliographic entry see Field 05A. W72-08064

MERCURY CONCENTRATIONS IN MUSEUM SPECIMENS OF TUNA AND SWORDFISH, California Univ., Irvine. Dept. of Cheraistry. For primary bibliographic entry see Field 05C. W72-08066

LIMNOLOGICAL FACTORS AFFECTING PESTICIDE RESIDUES IN SURFACE WATERS, Iowa State Water Resources Research Inst.,

Ames.
D. B. McDonald, and D. L. Mick.
Available from the National Technical Information Service as PB-208 969, \$3.00 in paper copy, \$0.95 in microfiche. Iowa Water Resources Research Institute, Ames, Completion Report ISWRRI-36, 1971. 7 p, 2 tab, 1 ref. OWRR A-027-14. (2) IA (2).

Descriptors: Pollutant identification, *DDT, *DDE, *DDD, *Pesticides, *Aldrin, *Dieldrin, Surface waters, *Iowa, *Chlorinated hydrocarbon pesticides, Water pollution sources. Identifiers: *Coralville Reservoir, *Iowa River, Lake MacBride, Cedar River, Alpha BHC, General BHC. Gamma BHC.

Samples of water, mud, periphyton and fish were taken from the Iowa River above and below the Coralville Flood Control Reservoir near Iowa City, Iowa, Lake MacBride and the Cedar River. All samples were analyzed for the major chlorinated hydrocarbons. These include DDT and its metabolites, BHC and its isomers, heptachlor and its metabolites, aldrin and its metabolite dielection Petrickle residents in water from the Iowa drin. Pesticide residues in water from the Iowa River and Coralville Reservoir varied from trace amount to a maximum of five parts per trillion. Mud samples from the Iowa River contained higher concentrations of pesticides than did water samples. Concentrations ranging from zero to a maximum of 28 parts per billion were found in mud samples. Periphyton samples contained far higher concentrations of pesticide than either water or mud samples. A few samples contained over 12 parts per million, but in general, total pesticide concentrations did not exceed 100 pps. Concentrations of pesticides in fish were far higher than those observed in the periphyton. Maximum concentrations of over one part per million were observed on several occassions. A

variety of factors appear to influence pesticide variety of factors appear to influence pesticide residue levels. These include types of fish, fat content and drainage area. The highest pesticide levels were observed in bottom-feeding fish. In general, the highest pesticide residues occurred in those fish with the highest fat concentration. Pesticide determinations for waters, muds, and periphyton and fish are summarized in 2 tables. (Powell-Iowa State) W72-08068

QUESTIONS AND ANSWERS ON WATER QUALITY STANDARDS.
Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08099

DISSOLVED OXYGEN CRITERIA. Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08100

RADIOLOGICAL CRITERIA. Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08101

PHOSPHATE CRITERIA. Environmental Protection Agency, Washington, D.C. Office of Water Programs For primary bibliographic entry see Field 05G. W72-08102

MIXING ZONES. Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08103

NITRATES. Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08104

MERCURY AND HEAVY METALS. Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08105

TEMPERATURE. Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08106

DISINFECTION.
Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08107

ANTIDEGRADATION. Environmental Protection Agency, Washington, D.C. Office of Water Programs.

For primary bibliographic entry see Field 05G.

PRELIMINARY FIELD STUDIES USING EARTH RESISTIVITY MEASUREMENTS FOR DELINEATING ZONES OF CONTAMINATED GROUND WATER, Federal Water Pollution Control Administration, Cincinnati, Ohio. Ohio Basin Region.

Groundwater, Vol 7, No 1, p 9-16, January-February, 1969. 7 fig, 10 ref.

Descriptors: "Groundwater, Water quality, *Water pollution, "Resistivity, Measurement, Analytical techniques, On-site investigations, "Texas, Water pollution sources, Path of pollu-tants, Pollutant identification. Identifiers: Long Island (Tex).

The measure of earth resistivity is a possible means of detecting and outlining zones of ground water contamination where a resistivity contrast exists between contaminated and uncontaminated ground water. As a preliminary evaluation of the use of electrical resistivity for defining zones of contaminated ground water, five sites on Long Island and three sites in western Texas were ex-amined. The surveys at three of the Long Island sites and at one of the western Texas sites were at least partially successful in their objectives. The lack of success at the other sites is attributed to the particular physical conditions that existed. Further effort toward developing electrical resistivity as a method for evaluating variations in ground water quality is encouraged. (Skogerboe-Colorado State) W72-08109

FIXATION OF ATMOSPHERIC NITROGEN BY NONLEGUMES MEADOWS. WET Agricultural Research Service, Fort Collins, Colo.

Soil and Water Conservation Research Div. L. K. Porter, and A. R. Grable. Agronomy Journal, Vol 61, No 4, p 521-523, 1969, 1 fig, 5 tab, 8 ref. July-August.

Descriptors: *Nitrogen fixation, Irrigation, Organic matter, *Grasslands, Mountains, *Soil microorganisms, Soil algae, Turf, Soil microbiolo-

gy, Water pollution sources.
Identifiers: *Mountain meadow, Nitrogen-15, Sod mats, Non-legumes, *Nitrogen fixing organisms

Mountain soils subjected to excessive irrigation and high water tables accumulate organic matter in sod mats. Meadow soils often contain two or three times more N than equal areas of adjacent dry soils. Symbiotic nitrogen fixation by legumes is one possible source of N for sod mat formation. Fixation of N2 by free-living organisms has also been postulated and was verified by the laboratory studies reported here. Nitrogen fixation by sod mats containing no legumes was determined at 18C in atmospheres containing N2 15. Both photosynthetic and nonphotosynthetic organisms appeared to fix N2. In 10 days, mats in the dark fixed from 0.76 to 1.90 kg N2 ha-1 and illuminated to the form 3.75 to 1.90 kg N2 ha-1 and illuminated to the form 3.75 to 6.65 kg N ha 1. (Cheere the fixed form 3.75 kg N2 ha 1.45 kg N ha 1.45 kg N2 ha 1.45 kg mats fixed from 3.72 to 6.86 kg N ha-1. (Skoger-boe-Colorado State) W72-08110

CROP SEEDLING UPTAKE OF DDT, DIEL-DRIN, ENDRIN, AND HEPTACHLOR FROM SOILS, Agricultural Research Service, Beltsville, Md.

Orops Research Div.
M. L. Beall, Jr., and R. G. Nash.
Agronomy Journal, Vol. 61, No. 4, p 571-575, July-August, 1969. 4 tab, 24 ref.

Descriptors: *Insecticides, *Pesticide residues, *Absorption, Alfalfa, Silts, *Endrin, *DDT, *Heptachlor, Crops, *Soil treatment, *Crop response, Soil moisture, Organic matter, *Diel-Identifiers: Crop seedling.

In greenhouse experiments, soybean, wheat, corn, alfalfa, bromegrass, and cucumber seedlings took up various amounts of DDT, dieldrin, endrin, and heptachlor residues from five soils treated with 0.5 or 5.0 ppm insecticide. Residue concentrations in or 3.0 ppm insecticide. Resolue concentrations in plants were usually well below the soil treatment rates, though endrin and heptachlor residues in alfalfa and bromegrass exceeded the treatment rate of some soils. The order of residue uptake in increasing amounts was DDT<dieldrin<endrin<

D. I. Warner.

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eptachlor. Correlations calculated between residues in seedlings and several soil characteristics revealed that organic matter negatively affected the uptake of DDT, dieldrin, and heptachlor. Silt negatively affected endrin uptake. Soil moisture content at 0.33 bar tension negatively af-fected DDT and dieldrin uptake by alfalfa. No sig-nificant correlations were found between uptake and soil pH, cation exchange capacity, or clay content. Soil analysis, 14 or 20 months after insec-ticide application, revealed residues of the insecticides, in increasing order of persistence, to be heptachlor-dieldrin approximately equal to en-drin-CDDT. Correlations calculated between residues in soils and the soil characteristics above revealed that persistence was positively correlated with soil organic matter. (Skogerboe-Colorado State) W72-08114

AVAILABILITY CHARACTERISTICS OF AND PLANT RESPONSE TO NITROGEN SOURCES, North Carolina State Univ., Raleigh. Dept. of Soil Science.
C. B. McCants.

Agronomy Journal, Vol. 61, No. 3, p 353-356, May-June, 1969. 2 fig, 6 tab, 10 ref.

Descriptors: *Nitrogen, *Fertilizers, *Leaching, Tobacco, Moisture content, Ureas, *Crop

Identifiers: Nitrogen availability, Controlled release fertilizers, Cottonseed meal.

The relative availability characteristics of nitrogen in urea, cottonseed meal, a commercial urea-formaldehyde product, and an experimental urea-wax material were studied through successive leachings in model lysimeters in the laboratory and by leaching and plant growth in the greenhouse. The effects of the nitrogen sources on yield and chemical composition of field-grown tobacco were studied under different moisture regimes. The total release of nitrogen from the urea-wax source was comparable to that from urea but significantly er than from urea-formal-dehyde or cottonseed meal sources. The rate of N release during the first 21 days was not different among the ureawax, urea-formaldehyde, and cottonseed meal sources; thereafter, it was higher from urea-wax. When differences in crop response occurred nong the different sources, the yield and quality index were higher from urea-wax than from cot-tonseed meal or urea-formaldehyde. These results and data from other research suggest that the probability of practical contributions of slow release fertilizers in the commercial production of annual field crops is quite small. (Skogerboe-Colorado State)

NUTRIENTS IN AGRICULTURAL TILE DRAINAGE.

Federal Water Pollution Control Administration,

Alameda, Calif. W. H. Pierce, L. A. Beck, and L. R. Glandon, Jr. Paper presented at 1969 Winter Meeting, American Society of Agricultural Engineers, December 9-12, 1969, Chicago, Illinois, Paper No. 69-709, 29 p. 9 fig, 6 tab, 17 ref.

Descriptors: *Nitrates, Drains, *Drainage water, *Tile drainage, Water quality, *Water pollution sources, Path of pollutants, Soil water, *Fertilizers, Phosphorus, Denitrification, Soil moisture, Nitrogen, Soils, *California.

Identifiers: *San Joaquin Valley (Cal).

A number of tile drainage systems were selected for monitoring within heavily tiled areas. Larger systems with a large number of rather closely spaced laterals on as many different soils as available were selected. Only tile drainage systems underlying fields having active irrigation and fertilization programs were selected. Wide variations were observed in tile drainage discharge and nutrient concentrations between the

systems monitored for any given time of year. Field investigations were initiated to develop esti-mates of the amount of nitrogen contributed by fertilizers and residual soil nitrogen to tile drainage nitrogen yields. Four tile fields were selected, and at each field soils, soil moisture at tile depth, soil moisture at depths of 10, 15, 20 and 25 ft, and tile drainage were sampled and analyzed for nitrates, chlorides and conductivity. Field studies of soils were conducted to characterize soil stratigraphy, and determine field moisture, nitrate-nitrogen, and specific conductivity in order to locate the lateral and up-slope limits of the high-nitrate bearing soils. Denitrification losses from several soils, under saturated conditions, were studied by means of laboratory scale lysimeters. (Skogerboe-Colorado State)
W72-08134

LAMINAR MOMENTUM JETS IN A

STRATIFIED FLUID, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.

Journal of Fluid Mechanics, Vol. 45, Part 3, p. 561-574, 1971, 6 fig, 2 tab, 10 ref. EPA Grant 16070

Descriptors: *Density stratification, *Jets, *Laminar flow, Fluid mechanics, Diffusion, Stratified flow, Stokes law, *Path of pollutants.

Solutions are presented for creeping flows induced by two- and three-dimensional horizontal and vertical momentum jets in a linearly stratified un-founded diffusive viscous fluid. These linear problems are solved by replacing the momentum jet by a body force singularity represented by delta functions and solving the partial differential equations of motion by use of multi-dimensional Fourier transforms. The integral representations for the physical variables are evaluated by a combination of residue theory and numerical integration. The solutions for vertical jets show the jet to be trapped within a layer of finite thickness and systems of rotors to be induced. The horizontal two-dimensional jet solution shows return flows above and below the jet and a pair of rotors. The three-dimensional horizontal jet has no return flow at finite distance and the diffusive contribution is found to be almost negligible in most situations, the primary character of the horizontal flows being given by the non-diffusive solution. Stokes's paradox is found to be non-existent in a densitystratified fluid. (EPA abstract)

MIXING OF DENSITY-STRATIFIED IMPOUND-MENTS WITH BUOYANT JETS, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources. I. D. Ditmars.

Report No. KH-R-22, September 1970. 203 p. 61 fig, 4 tab, 59 ref. EPA Grant 16070 DGY.

Descriptors: *Density stratification, *Mixing, *Reservoirs, *Jets, *Water quality, Stratified flow, *Path of pollutants, Fluid mechanics, Impoundments, Pumping, Identifiers: *Reservoir mixing.

The mixing was investigated of density-stratified impoundments by means of buoyant jets created by a pumping system. A simulation technique is developed to predict the time-history of changes in the density-depth profiles of an impoundment dur-ing mixing. The impoundment is treated oneensionally, except for the fluid mechanics of the three-dimensional jet and selective withdrawal of pumping system. The numerical solution to the of pumping system. The numerical solution to the governing equations predicts density profiles at successive time steps during mixing, given the initial density profile, the area-depth relation for the impoundment, the elevations of intake and jet discharge tubes, and the jet discharge and diameter. The changes due to mixing in the profiles of temperature and of a conservative, non-reacting

tracer can be predicted also. The results of a series of simulated mixing experiments for impound-ments which have prismatic shapes and initially linear density profiles are given in dimensionless form. For these conditions, the efficiency of the pumping system increased as the jet densimetric roude number decreased, and the time required for complete mixing was a fraction of the charac-teristic time, T less than V/Q (where V is the im-poundment volume included between intake and jet elevations and Q is the pumped discharge). (EPA abstract) W72-08136

SOIL SALINITY EFFECTS ON ABSORPTION OF NITROGEN, PHOSPHORUS, AND PROTEIN SYNTHESIS BY COASTAL BERMUDAGRASS, Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 02G. W72-08138

CHARACTERISTICS OF TRANSVERSE MIX-ING IN OPEN-CHANNEL FLOWS, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources. J. K. Okoye

Report No. KH-R-23, November 1970, 269 p., 75 fig. 18 tab. 67 ref. EPA Grant 16070 DGY.

Descriptors: *Mixing, *Dispersion, *Waste dilu-tion, Fluid mechanics, *Open channel flow, Tur-bulence, Path of pollutants.

The transverse spreading of a plume generated by a point source in a uniform open-channel flow was investigated. A neutrally-buoyant tracer was injected continuously at ambient velocity through a small round source at a point within the flow. Tracer concentration was measured in situ at several points downstream of the source using conductivity probes. Tracer concentration was analyzed in two phases. In Phase I, time-averaged concentration was evaluated, its distribution within the plume determined, and characteristic coefficients of transverse mixing calculated. It was shown that the transverse mixing coefficient varied with the flow level and was highest near the water surface where the flow velocity was greatest. The ratio of the depth-averaged coeffi-cient of transverse mixing Dz to the product of the (bed) shear velocity u* and the flow depth d was not a constant but depended on the aspect ratio lambda = d/W, where W = flume width. For laboratory experiments Dz/u*d decreased from 0.24 to 0.093 as lambda increased from 0.015 to 0.200. In Phase II, the temporal fluctuation of tracer concentration was studied in three sections. In the first, the intermittency factor technique was used to delineate three regions of the plume cross section: an inner core; an intermittency region; and an outer region. In the second section, the entire plume, at a fixed station, was treated as a fluctuating cloud. In the third section, the intensity and probability density of the concentration fluctuations at fixed points were calculated. Finally the results of the two phases of study were interre-lated to evaluate their contributions to the transverse spreading of the plume. (EPA abstract) W72-08139

SOME DATA ON THE DISTANCE-NEIGHBOUR FUNCTION FOR RELATIVE DIFFUSION, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.

P. J. Sullivan.

Journal of Fluid Mechanics, Vol. 47, Part 3, p. 601-607, 1971, 4 fig, 5 tab, 10 ref. EPA Grant 16070 DGY.

Descriptors: *Diffusion, *Dispersion, Descriptors: "Diffusion, "Dispersion, "Waste dilution, Lake Huron, Turbulence, Rhodamine, Distribution, Dye releases, Mathematical studies, Path of pollutants, Fluid mechanics. Identifiers: Distance neighbor function, Plumes. Repeated observations of dye plumes on Lake Huron are interpreted according to the theoretical proposals of Richardson (Proc. Roy. Soc. A Vol. 110, p. 709-737, 1926) and Batchelor (Proc. Comb. Phil. Soc. Vol. 48, p. 345-362, 1952) about the characteristics of a dispersing cloud of marked fluid within a field of homogeneous turbulence. The results show the average of several instantaneous concentration distributions about their center of gravity to be approximately Gaussian and the distance-neighbour function to be of approximately Gaussian form. The data are consistent with the theoretical description given by Batchelor, namely, q (y,t) = 1/ (sq root (2 pi y bar squared)) exp (-y squared/2 y bar squared), (y bar squared) (2/3 alpha) to cubed) where q (y,t) is the distance-neighbour function and alpha is the constant of the '4/3-power law'. The average value of alpha is estimated to be 0.12 cm (2/3 power)/sec. The rate of turbulent energy dissipation in the near-surface currents of Lake Huron is estimated as Epsilon is approximately equal to 0.0021/sq cm/cu sec. W72-08140

DISTRIBUTIONAL PATTERNS IN ASSEMBLAGES OF ATTACHED DIATOMS FROM YAQUINA ESTUARY, OREGON, Oregon State Univ., Corvallis. Dept. of Botany; and Oregon State Univ., Corvallis. Dept. of Statistics.

C. D. Mc Intire, and W. S. Overton. Ecology, Vol. 52, No. 5, p 758-777, Late Summer 1971. 9 fig, 11 tab, 25 ref.

Descriptors: *Diatoms, *Research equipment, Environmental effects, Estuaries, *Distribution patterns, *Aquatic algae, Statistical methods, Marine algae, *Oregon, *Seasonal, Chrysophyta, Systematics, *Estuarine environment, Sea water, Salinity, Water temperature, Chemical analysis, Water analysis, Tidal effects, Stability, Solar radiation, Photoperiodism, Fresh water, Sampling, Analytical techniques, Species diversity, *Diatoms.
Identifiers: *Yaquina Bay (Ore), Yaquina estuary, Data interpretation, Macroalgae, Species diversity index, Fragilaria construens, Cocconeis placentual, Navicula srytocephala, Achnanthes brevipes, Achnanthes javanica, Licmophora jurgensii, Amphora ovalis, Synedra fasciulata, Eunotia pecinalis, Lithophytes, Enteromorpha, Insolation, Texture, Substrates, Navicula mutica, Synedra fasciculata, Fragilaria striatula var california, Melosira moniliformis, Navicula diserta, Nitzschia frustulum var perpusilla, Melosira nummuloides, Navicula spp, Achnanthes spp, Achnanthes lanceolata.

Summer and winter distributional patterns of attached diatoms were investigated in Yaquina Bay and estuary, Oregon. Differences in species composition and diversity of diatom assemblages at selected stations from fresh water just below Elk City, Oregon, to the marine waters of lower Yaquina Bay were related to environmental gradients. A total of 16,475 diatoms from 30 samples was separated into 256 species and variational control of the gradients. A total of 16,475 diatoms from 30 samples was separated into 256 species and varieties, of which 97 were found in only one sample, and 72 were represented by a single individual. The most abundant diatoms in the August samples were Fragilaria striatula var. california, Melosira moniliformis, Melosira nummuloides, Navicula mutica, and Synedra fasciculata, while in the February samples Achnanthes no. 2 and no. 4, Navivula diserta, Navicula mutica, and Nitzschia frustulum var. perpusilla were dominant. Of the most abundant taxa, Navivula no. 2, Navicula diserta Navicula greenia, Nitzschia frustulum var. erta, Navicula gregaria, Nitzschia frustulum var perpusilla, Synedra fasciculata, and Thalas-sionema nitzschiodes were the most evenly disstonema intescribdes were the most eventy dis-tributed among the stations. The mean species diversity for diatom assemblages sample in February was slightly higher than that for assem-blages collected in August. In February the mean specific diversity within a genus was higher and the mean generic diversity slightly lower than in August. In general, differences in assemblages

were closely related horizontally to the salinity gradient and vertically to the desiccation and insolation gradients. However, biological factors were nore important in accounting for differences among assemblages in the summer than in the winter, and these factors were primarily species interactions between diatoms and macro-algae. (Holoman-Battelle) W72-08141

WASTEWATER TREATMENT TECHNOLOGY, Illinois Inst. for Environmental Quality, Chicago. For primary bibliographic entry see Field 05D. W72-08147

WATER QUALITY CRITERIA DATA BOOK, VOL. 1 - ORGANIC CHEMICAL POLLUTION OF FRESHWATER. Little (Arthur D.) Inc., Cambridge, Mass. For primary bibliographic entry see Field 05C. W72-08157

WATER QUALITY CRITERIA DATA BOOK, VOLUME 2 - INORGANIC CHEMICAL POLLU-TION OF FRESHWATER.
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05C.
W72-08158

EFFECT OF INDUSTRIAL AND DOMESTIC EF-FFECT OF INDUSTRIAL AND DOMESTIC EF-FLUENTS ON THE WATER QUALITY OF THE COUER D'ALENE RIVER BASIN, L. L. Mink, R. E. Williams, and A. T. Wallace. Idaho Bureau of Mines and Geology, Pamphlet 149, March 1971, 30 p. 17 fig, 12 tab, 30 ref, 3 ap-

Descriptors: Water quality control, "Industrial wastes, "Domestic wastes, "Effluents, Zinc, Cadmium, Fluorides, Toxicity, Data collections, Pollutant identification, "Idaho, Settling basins,

Waste water treatment.
Identifiers: *Coeur d'Alene River Basin,
*Macrobenthic fauna, *Mining wastes.

The Couer d'Alene River system of northern Idaho is divided into three components: The North Fork which supports a healthy aquatic communi-ty, the South Fork which has received mining and ty, the South Fork which has received mining and domestic wastes for over 80 years, and the Main Stem which has been affected by the condition of the South Fork. Water samples collected from 34 stations on the Couer d'Alene River system over a sixteen-month period indicate zinc and cadmium concentrations above toxic limits for fish survival over much of the South Fork and Main Stem. With the exception of fluoride which is high at two stations during low flow, concentrations of most other elements are comparable to or slightly greater than concentrations observed in the North Fork. The water quality data indicate one major source for zinc, cadmium, and fluoride and one Fork. The water quality data indicate one major source for zinc, cadmium, and fluoride and one less easily identifiable source. High river stage also increases total mass of zinc transported in solution, which suggests a source during high flow in addition to present day mine waste disposal operations. Elimination of the high zinc and cadmium concentrations is considered essential to the complete recovery of the river. Basin-wide instal complete recovery of the river. Basin-wide instal-lation of settling ponds for mill wastes (not for all industrial wastes) by December 1968 has greatly improved the quality of water, particularly with respect to suspended solids. As a result, macrobenthic fauna recently have been discovered in the South Fork and a greater number of species found in the Main Stem, which indicate that the river is beginning to recover. Raw sewage, discharged into the South Fork throughout its reach, is the source of a complex pollution problem. (Strachan-Chicago) W72-08163

ENVIRONMENTAL SPOILAGE IN THE USSR Aston Univ., Birmingham (England). Dept. of In-dustrial Administration. E. S. Kirby. New Scientist, Vol 53, No 777, p 28-29, January 6,

Descriptors: "Environmental effects, "Exploita-tion, "Foreign countries, "Natural resources, Water pollution sources, Erosion, Forest fires, Land management, Forest management, Evalua-tion, Governments, Water policy, Balance of na-ture, Economic impact. Identifiers: "USSR, Lake Baikal, Caspian Sea, Volga River, Planned economy.

Environmental degradation and pollution in the USSR are summarized, based on overt and detailed statements released by Soviet officials in recent years. Measures have been passed to stop pollution of Lake Baikal, one of the world's finest inland freshwater seas. Holding about 25,000 cu km of clear, potable water, a large part of Soviet reserves, the reservoir is being rapidly polluted by factories and lumbering along its shores, especially cellulose processing at the southern end; the Angara industrial area near Irkutsk; and injudicious tree cutting and ploughing in the watershed. Dumping of mineral and urban wastes into Lake Baikal also contributes to the spoilage. Nationwide, deforestation, erosion, urbanization, dehydration and pollution—in that order—are the subjects of many complaints and warnings. Cutting six million cu m of timber a year in the Caucasus after the war caused rivers to change from clear and uniform flows to sediment-laden, turbulent flows. Erosion threatens 45 million hecfrom clear and uniform flows to sediment-laden, turbulent flows. Erosion threatens 45 million hectares in Central Asia, and more in European Russia. The Volga River with an annual flow of 253 cu km per year represented double the water use 30 yr ago, but only one-third today. Levels of lakes and inland seas are falling-the Caspian, two meters; Aral Sea and Lake Balkash are shrinking in size. (Land-USGS)

TRANSPORT OF PICLORAM IN RELATION TO SOIL PHYSICAL CONDITIONS AND PORE-WATER VELOCITY, Oklahoma State Univ., Stillwater. Dept. of

Agronomy.

J. M. Davidson, and R. K. Chang.
Soil Science Society of America Proceedings, Vol
36, No 2, p 257-261, March-April 1972. 5 fig, 1 tab,
14 ref.

Descriptors: "Adsorption, "Herbicides, "Soil water movement, "Diffusion, "Pesticide kinetics, Flow, Leaching, Path of pollutants, Distribution patterns, Translocation. Identifiers: "Picloram.

Movement of a solution containing 4-amino-3, 5, 6-trichloro-picolinic acid (picloram) through an initially herbicide-free Norge loam soil was studied the trichtory-picolamic acid optionamy through an imitally herbicide-free Norge loam soil was studied using miscible displacement techniques. Picloram nobility was reduced significantly by decreasing the average pore-water velocity from 5.8 to 0.59 cm/hr. A variation in herbicide adsorption with pore-water velocity was observed at each bulk density (1.55 and 1.65 g/cm) and aggregate size (<2.0 and <0.42 mm) studied. For a given bulk density, picloram adsorption was greater when the largest soil aggregate size was <0.42 mm than when the largest aggregate size was <2.0 mm aggregates. Differences in the effluent concentration caused by variations in aggregate size were more evident at the lower bulk density. The pore-water velocity influenced picloram movement more significantly than variations in bulk density or largest aggregate size at a given flow rate. (Knapp-USGS) W72-08210

SOLID-WASTE DISPOSAL IN GEOHYDROLOGIC ENVIRONMENT MARYLAND, Geological Survey, Parkville, Md. E. G. Otton.

Available from Md Geological Survey, 214 Latrobe Hall, John Hopkins Univ., Baltimore, Md \$3.00. Maryland Geological Survey Report of In-

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vestigations No 18, 1972. 59 p, 15 fig, 18 tab, 52'

Descriptors: *Landfills, *Leaching, *Path of pollutants, *Waste disposal, *Maryland, Garbage dumps, Solid wastes, Urban hydrology. Identifiers: *Sanitary landfills

As Maryland is in a humid region having about 43 inches of precipitation annually, sufficient moisture passes through sanitary landfills to dissolve or otherwise carry along metals, chemicals, bacteria, and other undesirable materials, collectively called leachate. Rates of leachate infiltration range widely depending on the nature of the earth materials and the available water. Maryland was divided into five terrane types on the basis of the hydrologic characteristics of the land. Degradation of the underlying ground water by leachate is least likely in areas underlain by shale, but leachate generated at such sites may enter nearby streams unless adequate precautions are taken. Limestone or marble is somewhat less amenable to solid-waste disposal because of common development of solution channels and crevices. Crystalline silicate rocks of the Piedmont are suitable for sanitary landfills where a relatively thick zone of saprolite lies well above the water table. Upland Coastal Plain sites may be locally suitable where underlain by clayey strata well above the local water table. Low-lying Coastal Plain deposits offer protection from leachate pollution of deep-lying artesian aquifers because of thick and extensive impervious strata. (Knapp-USGS) W72-08221

RADIOACTIVE SEDIMENT TRACER TESTS, CAPE FEAR RIVER, NORTH CAROLINA, Waterways Experiment Station, Vicksburg, Miss.

R. S. Cummins, Jr.

Available from the National Technical Information Service as AD-733 846, \$3.00 in paper copy, \$0.95 in microfiche. Miscellaneous Paper No 2-649, May 1964. 27 p, 12 plates, 6 ref.

Descriptors: *Sediment, *Sediment transport, *Radioactive tracer, *Gold radioisotopes, Marking techniques, Tracking techniques, Movement mea-surement, *North Carolina, Path of pollutants. Identifiers: *Cape Fear River (NC).

Tests were conducted in an effort to determine whether or not dredge spoil placed in a disposal area opposite the Sunny Point Army Terminal was returned to the areas of heavy shoaling in the terminal basins. A total of 20 curies of gold 198, in the form of auric chloride, was used to label about 4 cu ft of bottom sediment which was released in the disposal areas in four separate operations. In three of these operations, labeled material was placed in the disposal area directly opposite Sunny Point Army Terminal, and in the fourth, it was placed upstream from the terminal. A continuous recording of radioactivity on the bottom in the problem area was made by means of a sled-mounted scintillation detector towed along the bottom. The posi-tion of the survey boat was established through the use of three transits, and the position was plotted at called time intervals. The strip chart on the recorder also was marked at these times for correlation of radioactivity and location. Results of tests showed that significant amounts of the material placed in the disposal areas were transported within about 36 to 48 hrs into the center and north wharf basins, regardless of whether the material was placed during rising or falling tide. (Houser-ORNL) W72-08232

PREDICTION OF THE DOSAGE TO MAN FROM THE FALLOUT OF NUCLEAR DEVICES. 6. TRANSPORT OF NUCLEAR DEVICES. 6. TRANSPORT OF NUCLEAR DEBRIS BY SURFACE AND GROUNDWATER, California Univ., Livermore. Lawrence Radiation Lab. H. L. Fisher

Available from the National Technical Information Service, \$3.00 in paper copy, \$0.95 in microfiche. UCRL-50163, Pt 6, January 1972. 26 p, 7 fig, 7 tab, 45 ref.

Descriptors: *Radioactivity, *Fallout, *Water pollution sources, Path of pollutants, Surface runoff, Groundwater movement, Permeability, Time, Storm runoff, Streamflow forecasting, Runoff forecasting, Projections, Reliability, Systems analysis, Forecasting, Hydrology, Topography, Fracture permeability.

In certain situations, the groundwater travel times and paths predicted on the basis of standard field measurements of aquifer properties (especially the permeability) can be highly misleading. Unless measurements are sufficiently detailed to resolve the effects of deviations from ideal behavior, contaminated groundwater may either arrive two orders of magnitude sooner than expected, arrive where unexpected, or the concentration front may arrive considerably before the peak concentration. Contamination of surface water is highly dependent on storms and on the yearly rainfall. (Bopp-ORNL)

THE USE OF RADIOISOTOPES IN SEDIMENT

TRANSPORT STUDIES, Waterways Experiment Station, Vicksburg, Miss.

R. S. Cummins, Jr., and L. F. Ingram.

Available from the National Technical Information Service as AD-733 951, \$3.00 in paper copy, \$0.95 in microfiche. Miscellaneous Paper No 2-564. March 1963. 19 p. 8 fig. 3 ref.

Descriptors: *Sediments, *Sediment distribution, *Suspended solids, *Sediment transport, *Tracers, Marking techniques, Movement, Descriptors: "Seumo."
*Suspended solids, *Sediment
Marking techniques, *Suspended solds, *Tracers, Marking techniques, Movement, Radioisotopes, Tracking techniques, Bottom sedi-

Identifiers: Concentration

The use of radioactive material for tracing sediments is only one tool to be employed in the overall analysis of a particular problem. It has limitations, but under certain situations can provide worthwhile results. Generally the information obtained from tracer tests is of a qualitative nature and pertains to relative rates of shoaling or con-centrations of material in certain areas. Quantitative measurements are extremely difficult at present because of the nature of sediment movement and the tracer material itself. If any of the labeled sediment is shielded by being covered with inert bottom material or moves in suspension above the face of the detector, the observed counting rate is decreased. In spite of limitations, tracing techniques offer the only method for continuously tracing sediments in deep water without direct sampling. (Houser-ORNL) W72-08234

PRELIMINARY DATA CONCERNING THE USE OF ARTHECIAL SUBSTRATA FOR THE USE ECOLOGICAL STUDY OF PERPHYTON AND FOR THE IDENTIFICATION OF ENVIRONMENTAL RADIOACTIVITY IN A RUNNING-WATER ECOSYSTEM.

Milan Univ. (Italy).

A. Zullini, E. Tibaldi, E. Smedile, and B. Radici.

Giornale DI Fisica Sanitaria e Protezione Contro Giornale Di Fisica Sanitaria e Protezione Contro Le Radiazioni, Vol 14, No 3, p 124-131, July-Sep-tember 1970. 3 fig, 5 tab, 30 ref. From 15th Na-tional Congress of the Italian Assoc. for Health Physics and Protection Against Radiation, Cagliari, Italy, Sept.-Oct. 1969.

Descriptors: *Aquatic animals, *Aquatic plants, *Aquatic environment, *Rivers, Radioisotopes, Ecosystems, Monitoring, Food chains, *Bioin-dicators, *Pollutant identification. Identifiers: Po River, Concentration.

Plant and animal composition of periphyton in a section of the Po River was studied using various

artificial substrates for growing periphytic forms. Substrate panels (plexiglas, eternit, glass, slate, PVC, marble, and masonite) were immersed in the river and the subsequent growth of periphyton was river and the subsequent growth of periphyton was analyzed for element concentration, pigment production, and net production rate and the component forms identified by species. The results are discussed within the framework of a broader ecological investigation dealing with food chains in which periphyton plays an important role and the possibility of using the periphytic forms as bio-in-dicators of environmental radioactivity. The data obtained from the artificial substrate studies con firm this possibility at least in relation to the algal and nematological components of the periphyton. (Houser-ORNL)

TRACE SUBSTANCES IN RAIN WATER: CON-CENTRATION VARIATIONS DURING CON-VECTIVE RAINS, AND THEIR INTERPRETA-

Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 05A.
W72-08240

CONSEQUENCES OF EFFLUENT RELEASE: ESTIMATES OF DOSE TO NORTHERN HEMI-SPHERE POPULATION GROUPS FROM KRYP-TON-85 EMITTED BY A SINGLE NUCLEAR FUEL-REPROCESSING PLANT, California Univ., Livermore Lawrence Radiation

For primary bibliographic entry see Field 05C. W72-08241

THE USE OF WATER-QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THERMAL EFFECTS PROBLEM, RAND Corp., Santa Monica, Calif. E. C. Gritton, J. Kvitky, and J. J. Leendertse. Rand Paper, P-4772, February 1972. 5 p, 6 ref.

Descriptors: *Water quality control, *Waste water (Pollution), *Thermal pollution, Mathematical models, Operations research, Management, Water models, Operations research, Management, Water pollution control, Estuaries, Bays, Tidal effects, Water levels, Velocity, Water temperature, Water analysis, Discharge (Water), *Model studies, *Simulation analysis. Identifiers: *Waste discharges, Coastal waters.

A water-quality simulation model was developed for use in well-mixed estuaries and coastal seas. The model is solved by finite difference techniques of the two-dimensional vertically integrated equations of motion and continuity for a fluid. Interaction and die-away of constituents is accounted for by a reaction model. Incorporated into this system is a heat transport model. Because of increased thermal discharge, it is highly important to correctly model the temperature of the waters of bays and estuaries in water quality stu-dies. Virtually every chemical and biological process occurring in the marine environment is coupled to the temperature of the surrounding water. (Bell-Cornell) W72-08257

MODELLING TECHNIQUES FOR SITING LARGE THERMAL POWER PLANTS ON INDUSTRIALIZED ESTUARIES, Clemson Univ., Clemson, S.C. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 06A.

W72-08266

MULTI-LAYERED MODELS OF CURRENTS, TEMPERATURE, AND WATER QUALITY PARAMETERS IN THE GREAT LAKES, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland

For primary bibliographic entry see Field 06A.

W72-08267

ROLE OF ANIMAL WASTES IN AGRICUL-TURAL LAND RUNOFF.
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering

Available from the National Technical Information Service as PB-209 213, \$0.95 in microfichs. Environmental Protection Agency, Water Pollution Control Pesearch Series, August 1971. 114 p, 32 fig. 19 tab, 75 ref, 2 append. EPA Program 13020 DGX 08/71.

Descriptors: *Farm wastes, *Runoff, *Agricultural runoff, *Water pollution, *Farm lagoons, Waste disposal, Sampling, Analysis, Disposal.

Twelve typical agricultural areas representing three types of animal waste management techniques--lagooning, direct discharge into streams, and land spreading including pasture and drylot units--were studied to determine the amounts of and factors governing stream pollution from swine, dairy, beef, and poultry production operations. More than 1500 stream and lagoon effluent samples were collected with an automatic sampler developed for the study. The samples sampler developed for the study. The samples were analyzed for bacteria, nutrients, and degradable organics. Hydrological and waste management data were also collected. Study results point to the superiority of land spreading to the light of the superiority of land spreading for the disposal of animal wastes. Good soil and water conservation practices should be used to minimize the movement of wastes into streams. Higher rates of runoff result in heavier pollution. The location of disposal areas away from streams is important in controlling the amount of entering wastes. Even when land disposal areas are poorly located, the amount of pollution entering streams is usually low; and watershed factors, such as surface culture and ease of erosion, are of primary importance in governing the magnitude of pollu-tion which reaches the streams. Direct dumping of animal wastes, treated or untreated, into streams is completely unacceptable and should be prohibited. (Dorland-Iowa State)

CHARACTERISTICS OF WASTES FROM SOUTHWESTERN CATTLE FEEDLOTS. Texas Tech Univ., Lubbock. Water Resources

Available from the National Technical Informa-tion Service as PB-209 214, \$0.95 in microfiche. Environmental Protection Agency, Water Pollu-tion Control Research Series, January 1971. 87 p, 23 fig. 23 tab, 72 ref, 1 append. EPA Program 13040 DEM 01/71.

Descriptors: *Runoff, *Livestock, Quality control, Analysis, Cattle, Confinement pens, Feed lots, *Farm wastes, Southwest U.S., *Agricultural runoff, Solid wastes, Irrigation, Texas, Water reuse.

Identifiers: *Ouality of runoff, *Lubbock (Tex).

Research was conducted on experimental feedlots in Lubbock, Texas, to determine the charac-teristics of wastes from Southwestern cattle feedlots. The feedlots were generally operated in a manner conforming to normal commercial practice in the area. They were provided with collection pits that allowed the quantity of runoff to be measured accurately. Samples of runoff were col-lected routinely both during rainstorms and from the collection pits. Manure samples were also collected routinely for analysis. The quantity of runoff per unit area of concrete-surfaced lots is substantially greater than the quantity per unit area of dirt-surfaced lots. Concentrations of pollutants in concrete-lot runoff are substantially higher than corresponding concentrations in runoff from dirt-surfaced lots. The quantity of solid waste derived from cattle fed an all-concentrate ration is less than half as great as the quantity derived from cat-tle fed a 12 percent roughage ration. Additional

studies showed that all solid waste derived from cattle feeding operations are readily composible, although the rate of composting is influenced to some extent by the type of ration, moisture content of the waste on the feedbot floor, and other tent of the waste on the recurs from, and other factors. Agronomic studies indicate that runoff can be used for irrigation of crops, but extreme caution is required in the application of runoff to crops to prevent damage to them. (Dorland-Iowa State) W72-08299

RELATIONSHIPS OF SALMONELLAE TO FECAL COLIFORMS IN BOTTOM SEDI-MENTS,

Environmental Protection Agency, Cincinnati, Ohio. Div. of Water Hygiene.
D. J. VanDonsel, and E. E. Geldreich.
Water Research, Vol 5, No 11, p 1079-1087,
November 1971. 3 fig. 3 tab, 21 ref.

Descriptors: *Indicators, *Salmonella, *Sedimentwater interfaces, Coliforms, Sampling, Mud-water interfaces, Coliforms, Sampling, Mud-water interfaces, Water quality, Sediments, Pathogenic bacteria, Streptococcus, Domestic wastes, Farm wastes, E. coli, *Bottom sediments.

Identifiers: *Bottom sampler, Resuspension, Bacterial concentration.

terial concentration.

The use of bottom sampling in water quality investigations is presently limited; however, the mud may serve as a concentrated and stable index of the quality of the overlying water. Salmonellae can be isolated from bottom sediments with far greater frequency than directly from the overlying water. Salmonellae were isolated from 19 percent of the mud samples when fecal coliform de the overlying water was between 1 and 200 per 100 ml; from 50 percent between 201 and 2000; and from 80 percent over 2000. Fecal coliform to fecal streptococcus ratios of the overlying waters in-dicated that most of the isolated salmonellae originated in domestic sewage, but there were some positive samples with low ratios, which sug-gests that their salmonellae came from livestock or wildlife. Mud-water interfaces are not static systems, sludge banks can shift to a new position in response to currents, storms, and dredging operations. The consequent recirculation of older pollutants poses new problems in water quality which must be considered. (Dorland-Iowa State)

THE USE OF FLUORESCENT ANTIBODY TECHNIQUES FOR DETECTION OF STREPTOCOCCUS FAECALIS AS AN INDICATOR OF FECAL POLLUTION OF WATER, North Texas State Univ., Denton. Dept. of Biological Sciences; and Clemson Univ., S.C. Dept. of Biological Sciences.

For primary bibliographic entry see Field 05A. W72-08304

A STUDY OF ORGANIC CARBON-BOD RELA-TIONSHIPS IN DILUTE DOMESTIC WASTE-WATER, Virginia Polytechnic Inst. and State Univ.,

Blacksburg. M. K. Jones, Jr.

Master's Thesis, March 1971, 73 p, 26 fig, 1 tab, 22

Descriptors: Water quality control, *Analytical techniques, *Laboratory tests, *Biochemical oxygen demand, Chemical oxygen demand, Water analysis, Eutrophication, Aeration, Carbon, *Domestic wastes. Identifiers: *Total organic carbon.

Domestic sewage samples from several locations were collected and analyzed for COD, BOD, and were confedence and analyzed for Cop., Body, and total organic carbon. Each sample was aerated for 120 hours in a mechanically aerated laboratory reactor and the relationship of the selected parameters was reported, to provide information. on how the ratios of these parameters vary with time of flow in the receiving stream. Results demonstrated that the ratios of total organic cardemonstrated that the ratios of total organic car-bon, chemical oxygen demand, and carbohydrate to biochemical oxygen demand are not constant but vary with degree of treatment received by a waste. Changes in the ratios result primarily from differences in the rate of depletion of biodegrada-ble materials measurable by the BOD test and other organics which are measured largely by the other parameters. While the BOD test measures the oxygen requirements it does not provide any measure of the amount of organic carbon remain-ing in the waste, and when used singularly, BOD determinations are not adequate to measure the total pollutional or eutrophicational capacity of a waste. Therefore, it is recommended that Total Organic Carbon tests should be adopted by both Federal and State regulatory agencies. (Lowry-Texas) W72-08374

EVALUATION OF NITRIFICATION IN STREAMS-CLOSURE, Michigan Univ., Ann Arbor. Dept. of Environ-

mental Health.

C. T. Wezernak, and J. J. Gannon. Journal, Sanitary Engineering Division, American Society of Civil Engineers, Vol 96, No. SA3, p 842-845, June 1970, 3 ref.

*Nitrification, *Mathematical Descriptors: models, "On-site investigations, Laboratory tests, Research and development, Ammonia, Nitrogen, Oxidation, Analytical techniques, Water quality control. Identifiers: *Deoxygenation.

Recent studies have indicated that, depending upon local conditions, nitrification in natural waters does not necessarily lag behind car-bonaceous BOD oxidation. Field evidence has been presented which demonstrated nitrogen to be a major deoxygenation component, and a rapid a major decognation component, and a rapid field technique for determining nitrification ef-fects using readily measurable parameters has been developed. The focal point of such techniques, however, must be the assumptions which were made in order for the model to be manageable. Stratton and McCarthy's model calculations are based on an estimate of the yield constant of 0.29 mg/l, while further work has yielded values from 0.05 to 0.098. Since the choice of the yield constant affects the magnitude of both calculated substrate utilization constant and the initial bacteria concentration, the final accuracy is somewhat questionable. The major difficulty in many nitrification models is that organisms for which nutritional requirements are not fully delineated must be accounted for, and therefore continuous research and revision of models is necessary in order to more fully understand the processes. (Lowry-Texas) W72-08381

THE PHASE-SEPARATION METHOD FOR THE CONCENTRATION AND DETECTION VIRUSES IN WATER, Hadassah Medical School, Jerusalem (Israel).

For primary bibliographic entry see Field 05A.

NITRATE AND WATER,
Missouri Univ., Columbia. Dept. of Soils.
M. Christy, J. R. Brown, and L. S. Murphy.
Science and Technology Guide, University of Missouri Extension, Columbia, p 9808-9809, March 1965, 2 fig. 1 tab

Descriptors: *Farm wastes, Nitrogen, Fertilizers, Legumes, Missouri, Alfalfa, Livestock, *Water pollution sources, *Nitrates, *Public health.

Nitrates in some water supplies have caused concern. A statewide survey showed that animal manures, inadequate sewage systems, and soil or-ganic matter comprised the primary sources of

Group 5B-Sources of Pollution

nitrate in water supplies. Even though nitrate has been found in shallow wells all over the state, the largest percentage of such wells have been found in areas with greatest livestock numbers. Other sources include the nitrogen from legumes and fertilizers. Ponds usually have a low nitrate level. On the other hand, water of springs contains nitrate, thought to originate from natural soil leachings and bat guano deposits in nearby caves. The annual bat guano deposits in nearby caves. In a unual flow of some large springs may contain many times more nitrate-nitrogen than the total fertilizer nitrogen used annually in Missouri. The reason for concern is potential health hazards. Nitrate can be especially hazardous to infants. One problem is that boiling will not remove nitrates. (Bundy-Iowa State) W72-08389

STREAM POLLUTION FROM FEEDLOT RU-

NOFF, Kansas State Dept. of Health, Topeka. Environmental Health Services.
J. L. Mayes, S. M. Smith, and J. R. Miner.

Paper presented at the Fourteenth Annual Con ference on Sanitary Engineering, University of Kansas, Lawrence, January 8, 1964. 24 p. 4 fig, 8

Descriptors: *Farm wastes, Feed lots, Kansas, Runoff, Biochemical oxygen demand, Chemical oxygen demand, Ammonia, Nitrogen, Fishkill, Cattle, *Agricultural runoff, *Water pollution sources, *Water pollution effects.

During the investigation of water pollution com-plaints and fish kills, the Kansas State Department of Health has found animal feedlot runoff to be the cause of a number of water pollution problems. The principal problems have occurred in water courses below feedlots where large numbers of farm animals, primarily cattle, are concentrated in feeding areas. Water pollution studies of streams polluted with feedlot runoff indicate that the ranoff is characterized by a high biochemical oxygen demand, high ammonia content, and heavy bacdemand, high ammona content, and neavy bac-terial populations. The pollution problem is inter-mittent since it occurs during the following runoff, but it causes a severe slugging effect on the stream. Serious depletion of the dissolved oxygen content of the stream may occur, especially if the stream is small or the waste load is large. Present knowledge does not allow a quantitative prediction of the degree of pollution that can be expected from a given feedlot operation on a given occasion. This seems to be dependent upon a variety of factors such as the size of the lot; the cleanliness of the lot when runoff occurs; general topography of the area and the location of the lot with respect to receiving waters; the amount of rainfall, its in-tensity and pattern within the drainage basin; the size of the receiving stream and the pollution con-trol measures in use. (Bundy-Iowa State)

CHARACTERISTICS AND EFFECTS OF CAT-TLE FEEDLOT RUNOFF. Robert S. Kerr Water Research Center, Ada, Okla

M. R. Scalf, W. R. Duffer, and R. D. Kreis In: Proceedings, Industrial Waste Conference, 25th, May 5, 6, and 7, 1970. Purdue University, Engineering Extension Series No. 137, Part 2, p 855-864, 10 fig, 3 tab, 6 ref.

Descriptors: *Farm wastes, *Runoff, *Fishkill, Cattle, Dissolved oxygen, Diversion structures, Sedimentation, Biochemical oxygen demand, Algae, Confinement pens, Impoundments, *Water pollution sources, *Agricultural runoff, *Water pollution effects, *Cattle, *Feed lots. Identifiers: Algal blooms.

Cattle feedlot capacity in the United States has been increasing at about 10 percent annually in recent years. Essentially, all this growth has been in the form of large scale feedlots of 5000 to 100,000 head capacity. As with the concentrations of people, the concentration of thousands of animals in a small area produces massive environ-mental problems. Rainfall runoff may contain pol-lutant concentrations 10 to 100 times those of raw municipal sewage, and uncontrolled access to streams can result in oxygen depletion, fish kills, and other long term, undesirable ecological condi-tions for miles downstream. This study was designed to measure the quantity of rainfall runoff and its pollutional characteristics from a commercial feedlot and evaluate the effect of this wastewater on small impoundments. Less than two weeks of sedimentation in runoff collection ponds produced on effluent with pollutant concentrations of 10 to 30 per cent of the mean direct runoff concentrations. The necessity of further treatment was demonstrated when the feedlot operator pumped collection pond effluent through an inadequate treatment system into a 45-acre flood reservoir were killed due to dissolved oxygen stress and high ammonia concentrations. (Dorland-Iowa State) control reservoir. Essentially, all game fish in the

EFFECTS OF AGRICULTURAL DISCHARGES

INTO FRESH WATER LAKES,
Orange County Pollution Control Dept., Orlando,

Fla. C. W. Sheffield, and R. T. Kaleel.

In: Proceedings, Industrial Waste Conference, 25th, May 5, 6, and 7, 1970. Purdue University Engineering Extension Series No. 137, Part 2, p 904-913, 5 fig, 4 tab, 4 ref.

Descriptors: *Drainage effects, *Denitrification, *Eutrophication, Runoff, Nutrients, Bottom sedi-ments, Drainage water, Nitrates, Water manage-ment, Peat, Phosphates, Dikes, Canals, Nitrification, Water pollution sources.

Identifiers: *Pumping discharge, Surface leeching,

Nutrient removal

Agricultural business has increased along with demands for its products. In the United States most winter and spring vegetable crops are grown in the warmer climates of Florida, Texas, Arizona, and California. To obtain crop growth needed for maximum production, land irrigation must be practiced. In Florida most of this farming is on peat soil that was at one time lake bottoms. Land of this nature is either developed naturally or reclaimed by man through diking and canaling systems. The ef-fects of agricultural discharges on receiving waters are discussed, including what is being discharged chemically and how it changes the chemical, physical, and biological characteristics of the receiving fresh water lakes. The effects of nutrients into a lake are difficult to ascertain due to the effects of other nutrient sources such as sewage treatment plants, bottom recycling, rainfall, runoff, and surface leeching. However, there is a definite need to reduce turbidity, nutrients, and solids concentration in pumping discharge. (Dorland-Iowa State)

THE RESPONSE OF FISH POPULATIONS IN THE WABASH RIVER TO HEATED EF-

DePauw Univ., Greencastle, Ind. Dept. of Zoolo-

For primary bibliographic entry see Field 05C. W72-08446

SURVEY OF MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION, State Univ. of New York, Stony Brook. Marine Sciences Research Center. M. G. Gross, J. A. Black, R. J. Kalin, J. R.

Schramel, and R. N. Smith.

Available from the National Technical Information Service as AD-723 431, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report Series No. 8 April 1971. 72 p, 26 fig, 10 tab, 64 ref. Descriptors: Water pollution sources, Water pollu-Descriptors: water pollution sources, water pollution effects, Waste disposal, Wastes, "Solid wastes, Analytical techniques, Water quality, Trace elements, Lead, Copper, Chromium, Silver, Sediments, Sewage, Benthos, Nematodes, Annelids, Gastropods, Clams, Crabs, Snails, New

Identifiers: Capitellids, Foraminifera, *New York Bight, Ostracods, Arthropods, Barnacles, Bryozoans.

Surveys were made on 122 square miles to determine distribution of waste deposits in New York Bight, and the total carbon contents and loss-onignition (volatile matter). Sample concentrations of chromium, copper, lead and silver were compared to the distribution of carbon rich deposits on the continental shelf. Atomic absorption specthe continental shelf. Atomic absorption spectrometric analysis was used on acid-extractable minor elements in waste deposits. Few groups of pollution tolerant organisms were abundant in sediments from the inner portions of the New York harbor. No living foraminifera were found in sediment from the East River. A few speices were found in Western Long Island Sojnd. Ostracoes were rare. (Svensson-Washington)

THE FATE AND EFFECTS OF PESTICIDES IN AQUATIC ENVIRONMENTS, Purdue Univ., Lafayette, Ind. Dept. of Forestry and Conservation. For primary bibliographic entry see Field 05C. W72-08452

A-029-CAL (1).

MICROBIOLOGICAL AND CHEMICAL ANALYSES OF TILE LINE DRAINAGE WATERS AND DEPOSITS IN IMPERIAL VAL-MICROBIOLOGICAL

LEY, CALIF, California Univ., Riverside. Dept. of Soil Science. D. L.Dumke. M.S. Thesis 1971. 75 p, 5 fig, 9 tab, 61 ref. OWRR

Descriptors: *Tile drains, *Bacteria, *Iron oxides, Manganese, *Tile drainage, *California, Path of pollutants, Pollutant indentification. Identifiers: *Imperial Valley (Calif), *Organic car-

Chemical analyses and microbial counts were made of tile line deposits in Imperial Valley, Calif. Iron oxide deposits generally have higher percentages of organic carbon than manganese deposits, but on the average have lower numbers of heterotrophic organisms. No definite correlations between the percentages of organic carbon, iron or manganese and the numbers of microbes were found. Manganese deposits had higher bacterial counts than the iron deposits, but not as high as was anticipated by microscopic examination. Bacterial populations of water samples were very low. Fungi were not found in filter gravel around several tile lines, but bacteria were present in moderately high numbers: 260,000 to 700, 000 in one gram W72-08453

ASSESSING ORGANIC POLLUTION FROM AGRICULTURAL, URBAN, AND WOODED LANDS, Rutgers - The State Univ., New Brunswick, N.J.

Dept. of Civil and Environmental Engineering.
S. L. Yu, W. Whipple, Jr., and J. V. Hunter.
Paper presented at the National Fall Meeting, American Geophysical Union, San Francisco, Calif., December 6-9, 1971, p 5, 2 fig. OWRR A-025-N.J. (1).

Descriptors: Water pollution sources, *Stream pollution, *Biochemical oxygen demand, Water pollution, Water quality, Path of pollutants, Environmental engineering, Organic wastes, *Organic loading, *New Jersey, *Urbanization, Domestic wastes, *Small watersheds, Farm

Identifiers: *Unrecorded pollution, Unrecorded

Organic pollution concentrations and loadings were investigated for six small New Jersey watersheds representing agricultural, urban and wooded lands. Data averaged separately for dry and rainy days showed considerably higher BOD concentrations and much higher loadings for the met days. Data were designed from the content of the conte wet days. Data vary significantly with land use. These results are of particular value for evaluating future unrecorded pollution loadings in rapidly developing metropolitan areas. (Whipple-Rutgers) W72-08456

STUDY ON THE STATE OF POLLUTION OF RESIDUAL WATERS OF MALTHOUSES AND BREWERIES,

Louvain Univ. (Belgium).

Louvain Ciny, (Beignum).
Th. Delcommune.
Bull Ass Roy Anciens Etud Brass Univ Louvain.
67 (2): 45-84. 1971. Illus.
Identifiers: Barley-M, Breweries, Malthouses,
Pollution, Residual, Yeast.

In a study designed to measure the state of pollu-tion of residual waters of malthouses and brewe-ries, determination of the dissolved O2, the long and complicated biological O2 demands (BOD) and the rapid and simple chemical O2 demand (COD) was first carried out. The BOD is always taken as a base for studies on pollutions, but in the present study, the BOD was compared with the COD in various residual waters of the malthouse and brewery (residues from barley soaking, draff water residues, residues from barley soaking, draff water residues, residues from fermentation, yeast residues, residues of beer from bottle washing). The different residual waters had very different ratios between the BOD and COD: 0.44 for the wort, 0.67 for draff waters, 0.71 for barley soaking waters, and 0.93 for the yeasts, but for the same residual waters, they were practically the same. Taking the ratios into account, the BOD can thus be determined from the COD.—Copyright 1972, Biological Abstracts, Inc. W72-08476

ON THE MEASUREMENT OF PRIMARY PRODUCTION AND BIOGENIC REAERATION IN FLOWING WATERS: 1. LABORATORY COMPARISON OF THE METHODS, (IN GER-MAN),

Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
For primary bibliographic entry see Field 05C.
W72-08478

QUANTITATIVE ESTIMATION OF LOW-MOLECULAR NINHYDRIN-POSITIVE MATTER IN WATERS RICH IN AUTUMN SHED LEAVES,

Bonn Univ. (West Germany). Zoological Inst.

R. Bretthauer.

Internationale Revue de Gesamten Hydrobiologie,

Vol 56, No 1, p 123-128. 1971.
Identifiers: Autumn, *Leaves, *Ninhydrin, Analytical techniques, *Humus.

A method is described to determine quantitatively the sum of low-molecular ninhydrin-positive sub stances in water of pools rich in shedleaves. The interfering influence of coloring matter, such as humic substances, can be avoided. The measurable quantities of the ninhydrin-positive matter may vary greatly, because 0.02 micro mol amino acids still can be determined and otherwise, the dye concentration can be diluted to determine higher amounts of ninhydrin-positive substances. The quantitative yields approach 100%. Moreover, the decrease of low-molecular ninhydrin-positive substances in waters rich in shed leaves was observed by model experiments. The amount of this ninby model experiments. The amount of this min-hydrin-positive matter is quite high a short time after the leaves are added and is decreased by or-ganisms more rapidly during the first week than later on.—Copyright 1972, Biological Abstracts, W72-08479

5C. Effects of Pollution

ALGAE CONTROL BY MIXING, STAFF RE-PORT ON KEZAR LAKE IN SUTTON, NEW HAMPSHIRE.

HAMPSHIRE. New Hampshire Water Supply and Pollution Con-trol Commission, Concord. For primary bibliographic entry see Field 05G.

EFFECTS OF HANFORD REACTORS ON COLUMBIA RIVER AND ADJACENT LAND

Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs. R. F. Foster.

Available from the National Technical Informa-tion Service as BN WL-SA-3679, \$3.00 in paper copy, \$0.95 in microfiche. 1970. 48 p, 15 fig.

Descriptors: *Columbia River, *Thermal pollu-tion, *Radioactivity effects, Radioactive wastes, Toxicity, Bioassay, Fish eggs, Fish, Chinook salmon, Trout, Strontium radioisotopes, Zinc radioisotopes, Phosphorus radioisotopes, Water-fowl, Geese (wild), Water temperature, Water pollution effects.

Identifiers: *Plutonium, Snake River, Lethal

Studies to determine the effect of effluents from the Hanford plutonium plant were begun in 1943, more than a year before operation, and have con-tinued since. The development of the plant and its potential as a source of radionuclides in the environment and of thermal pollution in the Columbia River are discussed. The studies that have been made to monitor these possible effects include bioassay-type studies of fish, fish eggs, and waterfowl, and monitoring of water temperature with comparisons back to 1938. It is concluded from these continuing studies that radiation dose received by the public have been well within guidelines and that no discernible radiation or thermal effects have occurred to the fish and wildlife population. Peak temperatures in the Columbia River are little different than they were prior to operation of the reactor. (Mortland-Battelle) W72-07891

THE ECOLOGY OF THE PLANKTON OFF LA JOLLA, CALIFORNIA, IN THE PERIOD APRIL THROUGH SEPTEMBER, 1967. California Univ., Berkeley

Available from the National Technical Informa-tion Service as UCSD-10-P20-54, \$3.00 in paper copy, \$0.95 in microfiche. Bulletin of the Scripps Institution of Oceanography of the University of California, La Jolla, J.D.H. Strickland, editor, Vol 17, Nov 16, 1970. 103 p, 42 fig, 17 tab, 98 ref.

Descriptors: *Plankton, *Biomass, *Sa *Nutrients, *Hydrography, *Pacific *Sampling, Nutrients, *Hydrography, *Pacific Ocean, Ecology, Water temperature, Phytoplankton, Zooplankton, Chlorophyll, Solar radiation, Vitamin B, Pigments, Growth rates, Algae, Food Vitamin B, Pigments, Growth rates, Algae, Food webs, Copepods, Organophosphorus compounds, Primary productivity, Salinity, Profiles, Phosphates, Nitrates, Silicates, Hydrographs, Isotherms, Carbon, Nitrogen, Phosphorus, Red ide, Photosynthesis, Depth, Systematics, Dinoflagellates, Diatoms, Trophic levels, Protozoa, Crustaceans, Fluorescence, Analytical schainses. Desirts, Steadies con Distribution

Protozoa, Crustaceans, Fluorescence, Analytical techniques, Detritus, Standing crop, Distribution patterns, Statistical methods, Mechanical equipment, Sampling, Pumps, Mortality. Identifiers: Organic carbon, Chlorophyll a, Organic nitrogen, Thiamine, Biotin, Vitamin B 12, Gonyaulax polyedra, Peridinium depressum, Metazoa, Calanus helgolandicus (Pacificus), Thermistors, Data interpretation, Counting.

Weekly observations of nearshore plankton and related hydrographic variables were made from mid-April to mid-September, 1967, at three stations, 1.4, 4.6, and 1.2.1 km offshore, just north of La Jolla. Daily water-temperature measurements were obtained from the Navy Electronic Laboratory Occanographic Research (NEL) Tower and the Scripps Institution of Oceanography pier. The amount of incoming solar radiation was measured at the Scripps Institution of Oceanography. At each weekly station, measurements were made of temperature, salinity, submarine light attenuation. temperature, salinity, submarine light attenuation, phytoplankton, microzooplankton, chlorophyll a, phosphate, nitrate, and silicate, the last four using automated methods of analysis. In addition, an estimate was obtained of the total amount of particulate and dissolved organic carbon, nitrogen, and phosphorus over the 'plant pigment depth'. Hydrography and chemistry; vitamin B12, thiamine, and biotin; estimates of phytoplankton crop size, growth rate, and primary production; relationships of phytoplankton species distribution to the depth distribution of nitrate; phytoplankton taxonomy and standing crop; numerical abundance and estimated biomass of microzooplankton, production of the planktonic copepod, calanus helgolandicus are discussed. Because there was a close correlation among each of the three plant nutrients and temperauture, 'upwelling', caused layers of high nutrient concentration to move nearer the area surface. The shoaling of the 'trophocline' was the feature probably most or the tropacone was the reature probably most responsible for qualitative and quantitative changes of productivity. Although the amount of detritus in the water appeared to depend on the level of primary production, the production had little effect on the amount of dissolved organic material except perhaps at the station closest to the coast, where the plant-cell concentration was densest. (Jefferis-Battelle) W72-07892

THERMAL INACTIVATION OF VIRUSES, REPORT 1. THE RELATIONSHIP BETWEEN THE RATE OF INACTIVATION AND TEMPERA-

TURE, Institute of Virology, Moscow (USSR).

A. S. Novokhatskii A. S. NOVOKRISKII.

Available from the National Technical Informa-tion Service as AD-732 710, \$3.00 in paper copy, \$0.95 in microfiche. U. S. Army, Fort Dietrick, Md. Translation No. 2764, November 18, 1971. 9 p, 5 fig, 3 tab, 33 ref. Translated from Vap. Virus, Vol. 15, No. 4, AD-732 710.

Descriptors: Microbiology, Microorganisms,
*Viruses, Proteins degradation, Heat resistance,
*Thermal properties, Analytical techniques, Infection, Biocontrol, Cultures, *Temperatures.

Identifiers: Venezuelen Equine Encephalomyellitis, Sindbis, Vesicular Stomatitis,
Nucleoproteins, Thermal degradation, *Thermal
reactivation, Infectivity reactivation, Infectivity.

Samples of Venezuelan equine encephalomyelitis, Sindbis, and vesicular stomatitis viruses were placed in cultures of fibroblasts of chick embryos and then grown in medium no. 199 with a 2 percent heated bull serum in preparation for tests on the effect of temperature on inactivity. Viral infectivi-ty was determined by plague titration under agar overlay according to Porterfield or Dalbekko. Cultivation of the cells and incubation of the plague forming system was conducted in an atmosphere containing 3 percent CO2. The viruses were heated suspended in a storage medium for 20 min at tem-perature from 20 to 70C and immediately titrated after heating. The temperature interval of 50 to 60C was shown to be critical for the viruses. Heating 20 min. at 70C completely inactivated the infectivity of the viruses. Degradation of proteins is rectivity of the viruses. Degradation of proteins is concluded to be a major inactivating factor. It was found that addition of magnesium sulfate helped stabilize the viruses at temperatures above 37°C. It is suggested that further work be done on viral du-rability under such conditions. (Mackan-Battelle)

Group 5C-Effects of Pollution

A HYDROBIOLOGICAL STUDY OF THE POL-LUTED RIVER LIEVE (GHENT, BELGIUM), Rijksuniversitair Centrum Antwerpen (Belgium).

RipsainVersian Centum Antwerper (beginn). Lab. of Ecology. W. H. O. De Smet, and F. M. J. C. Evens. Hydrobiologia, Vol 39, Issue 1, p 91-154, January 31, 1972. 3 fig. 38 tab, 75 ref.

Descriptors: "Rivers, "Bacteria, IPlankton, Physicochemical properties, "Algae, "Hydrobiology, Enteric bacteria, Sampling, Zooplankton, Phytoplankton, Water analysis, Pollutants, Aquatic algae, Aquatic microorganisms, Aquatic animals, Nutrients, Water pollution effects, Water quality, Seasonal, Suspended load, Bioindicators, Water pollution, Microbiology, Water temperature. Hydrogen ion concentration. Dissolved oxture, Hydrogen ion concentration, Dissolved oxygen, Biochemical oxygen demand, Nitrogen, Nitrates, Nitrites, Chlorides, Phosphates, Nitrates, Nitrites, Coliforms Cyanophyta, Chrysophyta, Pyrrophyta, Chlorophyta, Euglenophyta, Euglena, Diatoms, Scenedesmus, Odor, Agars, Odor-producing algae, Volumetric analysis, Colorimetry, Plankton nets, Cultures, Color, Chlar Donnia, Primary productivity. mydomonas, Daphnia, Primary productivity, Biomass, Secondary productivity, Aeration, Tur-bidity, Seston, Domestic wastes, Chemical wastes, Industrial wastes, Summer, Winter, Autumn, Methodology.

Identifiers: Amoebobacter roseus Chromatium okenii, Chromatium, Macromonas mobilis, Thiovulum majus, Thiospira winogradsky, Zooglea ramigera, Beggiatoa alba, Beggiatoa, Thiothrix nivea, Thiothrix tenuis, Merismopedia glauca, Dactylococcopsis smithii, Oscillatoria princeps, Oscillatoria amoena, Oscillatoria tenuis, Anabaena constricta, Lieve River, Potassium permanganate consumption, Saprobic valency, Sarcodina, Rhizopoda, Quantitative analysis, Suctorians, Harpactoidea, Counting chambers, Feces, *Belgium, Bacillariophyta, Bacteriaphyta, Cryptophyta, Xanthophyta, Ciliata, Suctorea, Rotatoria, *Lieve River (Belg.).

Physico-chemical, bacteriological, and plankton levels were determined about every two weeks (from 14 July 1964 to 15 March 1965) at six sites on the Lieve River. All samples were taken from the upper 20 cm of water at the middle of the river. Three of the sampling stations were located out-side and three inside the area of the river which was aerated. From the chemical and bacteriological point of view, the Lieve was characterized as heavily polluted. A pollution gradient can be demonstrated as well by physico-chemical investigations as by the biological results. The presence and the production of the plankton in the different places are discussed and some general considerations leading to a new work hypothesis are made. (Holoman-Battelle)

STUDIES AT OYSTER BAY IN JAMAICA, WEST INDIES. V. QUALITATIVE OBSERVATIONS ON THE PLANKTONIC ALGAE AND PROTOZOA.

Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.; and Johns Hopkins Univ., Baltimore,

Md. Dept. of Biology. For primary bibliographic entry see Field 05B. W72-07899

VARIOUS FORMS OF EUTROPHICATION OF EASTERN ALPINE LAKES,

Ingo Findenegg. Schweizerishe Zeitschrift fuer Hydrologie. 33 (1): 85-95. 1971. Illus. English summary.

Descriptors: *Eutrophication, Lakes, Alpine, *Biomass, Water pollution effects, *Phytoplank-

Identifiers: Identifiers: *Alpine lakes, Ankistrodesmus, Ceratium, Cyclotella, Oocystis, Oscillatoria-Ru-

Since about 1965 some Austrian lakes have passed Since about 1965 some Austrian lakes have passed into a state of advanced eutrophication because of the pollution generated by the tourist industry. Previously all these lakes had a stock of very similar phytoplankton species. With increasing eutrophication the planktic communities developed in completely different ways. Two rather small prealpine lakes similar to each other in cost limplegical respects demonstrated this very most limnological respects demonstrated this very clearly. In the Wallersee a 12-fold algal biomass, composed almost exclusively of Ceratium, developed. The Obertrumer See was invaded by Oscillatoria rubescens, which raised the biomass 5-fold while Ceratium was eliminated for a longer period. In the Mondsee a combination of these different ways of eutrophication was observed. In 1968 a heavy increase of Ceratium occurred followed by a massive invasion of Oscillatoria. In the Millstatter See the total algal biomass increased 3fold. The summer communities of phytoplankton are composed mainly of Occystis and Ankis-trodesmus. The neighboring Ossiacher See, how-ever, shows a regular peak of Cyclotella in early summer and water blooms of Anabaena in autumn. The phytoplankton of the Worthersee shows comparatively small reactions to the increase of pollu-tion. For many decades it has been a typical Oscillatoria lake. This species lives in the superficial layers during winter and in spring uses up most of the nutrients of the epilimnion before retiring into the metalimnion. As the marked thermocline blocks the movement of nutrients from deeper strata, the algal biomass remains low during summer.--Copyright 1972, Biological Abstracts, Inc. W72-07905

ECOLOGICAL IMPLICATIONS OF MERCURY POLLUTION IN AQUATIC SYSTEMS,

Florida State Univ., Tallahassee. Dept. of Oceanography. Robert C. Harriss.

Biol Conserv. 3 (4): 279-283. 1971. Illus.

Descriptors: *Mercury, *Aquatic environment, *Ecosystems, Water pollution effects, Water pol-

Mercury compounds discharged into the environment from industrial, agricultural, and domestic sources have contaminated a substantial portion of the hydrosphere and other parts of the biosphere. Their effects on aquatic ecosystems are a result of their low solubility in water, chemical stability in sediments, and accumulation through biological concentration and magnification in food-webs. The limited data available on the environmental chemistry and toxicity of mercurials prevent the establishment of adequate standards for the protection of biotic communities.—Copyright 1972, Biological Abstracts, Inc. W72-07906

THERMAL DISCHARGES: ECOLOGICAL EF-

Battelle Memorial Inst., Columbus, Ohio. A. A. Levin, T. J. Birch, R. E. Hillman, and G. E. Environmental Science and Technology, Vol. 6, No. 3, p 224-230, March 1972. 1 fig, 1 tab

Descriptors: *Thermal pollution, *Crustaceans, Pescriptors: "Inerman poliution, "Fish, Heated water, Nuclear power plants, Electrical power plants, Heat transfer, Water pollution effects, Water temperature, Algae, Bullheads, Salmon, Shellfish, Clams, Marine animals, Aquatic life, Ecosystems, SalmCnids.

Identifiers: Chalk Point, Columbia River, Patuxent River, Contra costa power plant, San Joaquin River, Morro Bay Power Plant, Humboldt Bay, Conneticut Yankee Nuclear Plant, Connecticut River, Turkey Point, Biscayne Bay, Florida, Balanus, Barnacles, Epifauna, Sagartia, Balanus, Barnacles, Epifauna, Sagartia, Anemone, Molgula, Tunicate, Pismo clam, Tivela stultorum, Ostrea lurida, Cardium corbis, Cockles, Protothaca staminae, Littleneck clams, Saxidomus giganteus, Butter clams, Tresus nuttalli, Gaper clams, Species diversity, Macroinver-

By using projections of both fossil and unclear fueled electrical generation capacity, data on ther-mal efficiency and water withdrawal as well as the quantity of waste heat that will be dissipated into condenser cooling waters by the electrical utility industry can be estimated. Based on studies conducted at generator station sites, degradation of aquatic ecosystems appears to vary with the generator system and its output and the flora and fauna of the site. Some fish and crustaceans tolerate temperature changes even to an instant increase of 25 degrees F with no mortality. Certain bivalves and shellfish find discharge canals supportive or favorable. Heated effluents have been shown to reduce the diversity and abundance of phytoplankton, algae, and animals in some areas suggesting that an increased output and expansion of the industry may increase the deleterious effects and make waste management more difficult. No information is available yet on sublethal effects of thermal discharge. Although no major damage has been observed, ecological changes have taken place. Recommendations for standards for limiting thermal load on aquatic ecosystems are suggested. (Mackan-Battelle)
W72-07907

POISONING WITH DDT: SECOND-AND THIRD-YEAR REPRODUCTIVE PER-THIRD-YEAR REPRODUCTIVE FORMANCE OF ARTEMIA, North Carolina State Univ., Raleigh. D. S. Grosch.

Pollution - Foundations for Today, Vol. 2, p 84-85, 1 tab, 8 ref, 1971. PHS Grant ES-000-44.

Descriptors: *DDT, *Pesticide toxicity, *Brine shrimp, Path of pollutants, Food chains, Water pollution effects, **. Crustaceans, *Lethal limit. Bioassay, *Toxicity, Identifiers: Biological magnification, DDD, DDE, Macroinvertebrates, Lethal dosage.

In 1966, seven 3-liter population jars of brine shrimp were subjected to 1.00 ml doses of p,p'DDT from a dilution series dissolved in acctone to assess alterations in fertility and fecundity. Only 2 populations, of sublethal dosage, survived beyond 3 weeks. No induced genetic change was expressed in the FI generation. Contrary to expectations, subsequent brother-sister matings reflected no delayed dominant lethal phenomena or segregation of deleterious recessive genes. In 1967-68, populations of shrimp instituted as sub-cultures in 1966 were available for comparison. Jars compared contained (1) 10 ppt DDT popula-tion; (2) a subculture of 1; (3) a 1 ppt DDT popula-tion; (4) a subculture of 3; (5) a control population. In June 1969, analysis of jars 1, 3, and 5 showed that total p,p'DDT content of jars 1 and 3 exceeded controls by 0.12 and 0.10 micrograms respectively, and DDD and DDE traces were present. This order of magnitude is expected to alter fertility in insects, but is sublethal for adult crabs and oysters in the food chain. Apparently a toxic residue of the original dose persisted despite losses by co-evaporation, shrimp transfer, and conversion by microorganisms. The persistent DDT was fatal to a number of nauplii in the shrimp life cycle. Although nongenetic in character, the cyclic coexistence of pesticide residues and vulgenerations. (Mackan-Battelle)
W72-07910

OF POLLUTION DAMAGE OBSERVED IN TROPICAL COMMUNITIES ALONG THE AT-LANTIC SEABOARD OF PANAMA.

Smithsonian Institution, Washington, D.C. Dept. of Invertebrate Zoology.

K. Rutzler, and W. Sterrer.

Pollution - Foundations for Today, Vol. 2, p 70-73, 8 fig, 1 tab, 3 ref, 1971.

Descriptors: *Water pollution effects, *Oil wastes, *Crustaceans, Oily water, Algae, Nematodes, Oysters, Mussels, Protozoa, Mangrove swamps, Littoral, Shores, Tides, Beaches, Sands, Intertidal areas, Annelids, Copepods, Crabs, Aquatic life, Bacteria. Identifiers: *Oil spills, S.S. Witwater, Galeta Island, Canal Zone, Macroinvertebrates, Diesel fuel, Bunker C oil, Avicennia, Rhizophora, Bostrychietum, Fiddler crabs, Mesofauna, Turbellaria, Sponges, Tunicates, Bryozoans, Sea turtles.

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The rupture of the tanker S.S. Witwater in December, 1968, spilled nearly 20,000 barrels of diesel and Bunker C oil near the shoreline of Galeta Island, Canal Zone. Much of the oil was removed by burning and pumping. However, subsequent investigations conducted to study the effects of the remaining oil showed a number of detrimental effects. In Rocky Shore Areas, polluted water spray killed trees and shrubs. Supralittoral spray pools and upper mesolittoral tidal pools which were covered with an oil layer were devoid of life. Damage to gastropod and barnacle populawhich were covered with an oil layer were devoid of life. Damage to gastropod and barnacle populations was assumed. Subtidal coral reefs and associated organisms showed no effects since they were exposed to the oil. Beach Meiofauna such as turbellaria, nematodes, Annelida, Copepods and others were radically destroyed because of the complete permeation of the oil. Crustaceans were first to disappear. Small ciliates thrived on the increasing numbers of oil degrading bacteria. In the mangroves, trees were severely damaged or killed, the fiddler crab population was reduced and the inmangioves, trees were severely damaged of killed, the fiddler crab population was reduced and the intertidal algae community 'Bostrychietum' and its microfauna were practically eliminated, as were oysters, mussels, sponges, tunicates, bryozoans, sea turtles, and sea birds. (Mackan-Battelle) W72-07911

PRELIMINARY NOTES ON CHANGES IN ALGAL PRIMARY PRODUCTIVITY FOLLOW-ING EXPOSURE TO CRUDE OIL IN THE CANADIAN ARCTIC, Ottawa Univ. (Ontario). Dept. of Biology.

Mike Dickman. Can Field Nat. 85 (3): 249-251. 1971.

Descriptors: *Primary productivity, *Oil wastes, *Arctic, *Algae. Identifiers: *Canadian arctic, *Chlamydomonasspp, *Cryptomonas-spp.

Mackenzie Valley crude oil which had been exposed for 2 mo. to natural arctic summer condi-tions was added to bottles containing algae taken from a marsh near Inuvik, N. W. T. (Northwest Territories). C-14 primary productivity was 10 times lower in the oil treated samples (0.59 + 0.30 mgC/m3/hr) than in the untreated control samples (5.12 + 1.2 mgC/m3/hr) after a 4 hr incubation period. Small flagellates such as Cryptomonas spp. and Chlamydomonas spp. comprised nearly 80% of the primary producers in the Inuvik marsh samples. Some implications of the significance of these preliminary findings are discussed in view of the proposed 800 mi. Mackenzie Valley Pipeline route.—Copyright 1972, Biological Abstracts, Inc. W72-07922

THE NATIONAL ENVIRONMENTAL CRISIS---AN ENGINEER'S VIEW, Engineer School, Fort Belvoir, Va. W. B. Willard, Jr.

Military Engineer, Vol. 63, No. 416, p 375-379, November-December 1971, 5 photo, 9 ref.

Descriptors: *Pollution control, *Water pollution Descriptors: "Poliution control, "Water poliution control, "Standards, "Thermal pollution, Water quality, Environmental engineering, Deterioration, Air pollution, Federal Government, Solidwastes, Radiation effects, Radiation, Environmental effects, Industrial wastes, Water pollution, Nutrients, Air pollution effects, Environmental Identifiers: "Environmental quality, Environmental evaluation, "Air pollution control. Few issues in the history of the U S have generated as much public concern and awareness as the deterioration of the quality of the natural surroundings. Now the Nation must accept the responsibility for major environmental repair. The Federal Government has created the laws, and the organization exists through which the fight against pollution can be started. National air and water pollution control standards have been established, the Federal Government has assumed responsibility for developing means of solving the solid-waste pollution problem, and radiation tolerances are being reevaluated. All of these factors will be part of the total environmental repair program. The success of such a continuing program will depend largely on the work of engineers in correlating research and advanced technology with all aspects of the problem. (USBR) Few issues in the history of the U S have

MICROBIOLOGICAL ASPECTS OF THE POL-LUTION OF FRESH WATER WITH INOR-GANIC NUTRIENTS, Wisconsin Univ., Madison. Dept. of Soil Science; and Edinburgh Univ. (Scotland). Dept. of Microbiology

and Edinburgh Univ. (Scotland). Dept. of Microbiology. D. R. Keeney, R. A. Herbert, and A. J. Holding. In: Microbial Aspects of Pollution, G. Sykes and F. H. Skinner, editors, Society for Applied Bac-teriology Symposium Series No 1, p 181-200, 1971. Academic Press, London. 2 fig, 3 tab, 99 ref. EPA Program 16010 EHR.

Descriptors: *Water pollution, Microorganisms, *Inorganic compounds, *Nutrients, Fresh water, Algae, Bacteria, Nitrogen, Phosphorus, Oxidation-reduction potential, Lakes, Soils, Eutrophication, Ammonification, Nitrification, Denitrification, Nitrogen fixation, Sediments, Nitrates, Wiscoepis. Wisconsin

Identifiers: *Limiting nutrients, Lake Mendota

This literature review considers both phosphorus and nitrogen but emphasizes microbial processes governing nitrogen availability, primarily in lake systems. However, many principles are applicable to river systems when comparable environmental conditions prevail. Due to the many complex competing biological reactions occurring within an ecosystem it is extremely difficult to determine relative importance of each individual microbial process. The nitrate-nitrogen balance at any given time is governed by the relative rate of nitrate-nitrogen loss (resulting from denitrification and immobilization) to the rate of nitrate-nitrogen regeneration (from groundwater seepage, stream drainage, and ammonification/nitrification). Algal growth is largely governed by nitrogen and phosphorus availability. Nitrogen fixation by bluegreen algae probably constitutes only 1-2% of the input into fresh-waters but it may be important to biological productivity when inorganic nitrogen levels become depleted during the summer. The small bacterial populations found in oligotrophic waters suggest their role in nutrient cycling is perhaps minimal. In eutrophic waters, oxygen depletion by microorganisms can lead to a series of events largely governed by the redox potential. Valid model systems, whereby individual parameters can be controlled are invaluable in diferentiating specific microbial processes to aid in predicting fresh water behavior in response to varying nutrient loads. (Jones-Wisconsin)

EVIDENCE THAT NITROGEN SUPPLY IN-FLUENCES THE DISTRIBUTION OF A FRESH-

WATER MACROPHYTE, CERATOPHYLLUM DEMERSUM, Hull Univ. (England). Dept. of Botany. R. Goulder, and D. J. Boatman.
Journal of Ecology, Vol 59, No 3, p 783-791, 1971.

Descriptors: *Plant growth, *Aquatic plants, *Nitrogen, Distribution, Fresh water, Ponds, Ammonia, Submerged plants.

Identifiers: *Ceratophyllum demersum, Bran-desburton, Holderness (England).

desburton, Holderness (England).

Some flooded gravel workings at Brandesburton, northeast England, had much Ceratophyllum demersum in one pond but none in the others. Distribution studies were made, in the field and laboratory. Water was analyzed, oxygen profiles obtained, and total nitrogen content of Ceratophyllum determined. No major physical differences exist between the ponds. Throughout 1967, surface-water nitrate concentration of two ponds was measured at intervals. In Sangwin pond, nitrate was high until late June, low through the summer, and increased in November. No nitrate was detected in Scales pond during 1967. After 18 days, mean length of shoots in Sangwin water was greater than in Scales water. Growth in Scales water alone demonstrating nitrogen deficiency in Scales water. Growth in Sangwin water was still nore than in Scales water plus nitrate was greater than in Scales water alone demonstrating nitrogen deficiency in Scales water. Growth in Sangwin water was still nore than in Scales water plus nitrate. Addition of nitrate to summer Sangwin water stimulated growth. Sources of summer nitrogen to Ceratophyllum in Sangwin pond were probably nitrogen stored in the tissues earlier and a reservoir of ammonia in the anaerobic hypolimnion. Ceratophyllum seems to be a nitrophilous plant voir of ammonia in the anaerobic hypolimnion. Ceratophyllum seems to be a nitrophilous plant requiring high inorganic nitrogen levels in the sur-rounding water at least part of the year. (Jones-Wisconsin) W72-07935

ENDOGENOUS LIGHT-ON RHYTHM IN RESPIRATION OF A LONG-DAY DUCKWEED, LEMNA GIBRA, G3 II. ON BASIC AND RHYTHMIC COMPONENTS OF THE RHYTHM, Nagoya Univ. (Japan). Biological Inst.

H. Miyata.

Plant and Cell Physiology, Vol 12, No 4, p 517-524, 1971. 7 fig, 13 ref.

Descriptors: *Aquatic plants, *Light, *Respira-tion, *Oxygen, Absorption, Fluorides, Plant growth, Metabolism, Inhibitors, Cultures, Diurnal Identifiers: *Oxygen uptake, *Rhythm, *Lemna gibba G3, Glucose, Sodium malate, Sodium citrate, Sodium pyruvate, DNP, Azide, Iodoacetate.

A diurnal oxygen-uptake rhythm in a long-day duckweed, Lemna gibba G3, was demonstrated. The effects of respiratory substrates (glucose, malate, citrate, and pyruvate) and inhibitors (fluoride, iodoacetate, azide, and DNP) on the oxygen-uptake rhythm of this duckweed, in continuygen-uptake rhythm of this duckweed, in continuous light period, were examined. Rates of oxygen-uptake at the starting point (6 hours after the beginning of a continuous light period) and at the time of the first peak of the rhythm (18 hours after the beginning) were equally increased by exogenous substrates. Sensitivity of respiration to fluoride or iodoacetate was almost the same at the fluorided 1954 hours. The was almost the same at the Illudrate of iodoacetate was aimost the same at the 6th and 18th hour. The oxygen uptake (at the 6th, 18th, 30th, and 42nd hour) was increased by DNP by the same amount. Azide at lower concentrations than 0.0005 Molar did not affect oxygen-uptake at the 6th hour, but inhibited uptake at the 18th. In the presence of 0.0005 Molar of azide, rates of oxygen uptake at the 18th, 30th, or 42nd hour were down to the rate at the 6th hour, which hour were down to the rate at the 6th hour, which was insensitive to azide. These results suggest that the oxygen uptake rhythm consists of two components—the basic respiration promoted by exogenous substrate, sensitive to DNP and insensitive to azide; and rhythmic respiration, sensitive to azide, but not influenced by exogenous substrate and DNP. (Jones-Wisconsin) W72.0736

A REVIEW OF THE FACTORS LIMITING THE GROWTH OF NUISANCE ALGAE, Michigan Water Resources Commission, Lansing.

Albert Massey, and John Robinson. Water and Sewage Works, Vol 118, No 11, p 352-355, 1971, 38 ref.

Group 5C-Effects of Pollution

Descriptors: *Algal control, *Nuisance algae, Eutrophication, Reviews, Trophic level, Phosphorus, Phosphates, Carbon, Vitamin B, Nitrog.n, Cyanophyta, Lake Michigan, Nutrients. Identifiers: *Limiting factors, Silicon.

Isolating the key factor which limits algal growth has proven confusing because the aquatic ecosystem is a multifactor system in dynamic equilibrium established by the particular geochemical character and biota of the lake. That phosphorus is the limiting element has been theorized since limnology's infancy. Through in-dependent research numerous investigators have established that phosphorus is the element which usually limits algal growth. Since shortage of any of 15 elements may limit algae if phosphorus or nitrogen is added, primary production increases until some other element becomes limiting. Continued depletion of silicon will favor proliferatio of phytoplankton other than diatoms and could result in blooms of undesirable algae. Because some algae fix atmospheric nitrogen, control of cultural eutrophication by limiting nitrogen supply is highly questionable. Three recent papers proposing that carbon rather than phosphorus is the growth-limiting factor, contain no original research. The carbon supply from inorganic sources, from the atmosphere, from bacterial degradation, would be more than adequate to force some other factor to be limiting. In terms of practical technology one would almost have to answer that it would be necessary to control phosphorus. With the reduction of phosphate inputs, cultural eutrophication of lakes may be slowed, stopped or even in some cases reversed. (Jones-Wisconsin) W72-07937

A STUDY OF THE STRENGTH AND STABILI-TY OF GAS VESICLES ISOLATED FROM A BLUE-GREEN ALGA,
London Univ. (England). Dept. of Botany.

Barara, Buckland, and A. E. Walsby. Archiv fur Microbiologie, Vol 79, No 4, p 327-337, 1971. 4 fig, 1 tab, 8 ref.

Descriptors: *Cyanophyta, *Biological mem-Descriptors. Cyanophrida, Stological Inten-branes, *Laboratory tests, Hydrogen ion concen-tration, Enzymes, Temperature, Proteins, Physi-cal properties, Cytological studies. Identifiers: *Gas vesicles, *Anabaena flos-aquae.

The critical pressures on gas vesicles, isolated intact from the blue-green alga Anabaena flos-aquae, under various physical and chemical conditions and in the presence of factors which may affect their stability inside the alga were investigated. High concentrations of urea and of vestigated. Fight concentrations of une and of divalent cations, hydrogen ion concentrations above 9 and below 7, exposure to proteolytic enzymes, and temperatures over 40C, all resulted in weakening of the gas vesicles, as indicated by changes in their range of critical-collapse pressure Detergents have no apparent increase in critical pressure, suggesting that the interfacial tension at the outer surface of the membrane is very small. Improvements in method of isolating the intact gas vesicles gave better than 50% recovery and mem branes of 97.6% purity. Gas vesicles prepared in this way could be preserved intact by freeze-drying. Chemical analysis of the gas vesicle membrane has demonstrated that protein is the only component of the membrane. The strength of membrane material will reside in the various bonds holding the protein macromolecules together, and stabilizing the protein in its particular conformation. Exposure to conditions which interfere with such bonds would result in weakening the whole structure. (Jones-Wisconsin) W72-07938

COEXISTENCE OF SPECIES OF ACARTIDAE (COPEPODA) IN THE COCHIN BACKWATER, A MONSOONAL ESTUARINE LAGOON, Indian Ocean Biological Centre, Cochin, (Índia). D. J. Tranter, and S. Abraham.

Marine Biology, Vol 11, No 3, p 222-241, 1971. 21 fig. 5 tab, 49 ref.

Descriptors: *Copepods, *Estuaries, Dominant organisms, Plankton, Seasonal, Salinity, Tempera-ture, Marine animals, Ecological distribution, Temporal distribution, Spatial distribution. Synecology, Plant morphology, Food habits, Niches.

Identifiers: *Acartiidae, *Cochin backwater, Kerala (India), Pseudodiaptomids, Species diver-

The Cochin Backwater, Kerala, India, is a periodically unstable environment inhabited by many copepods of the family Acartidae which form the dominant planktonic component. At least nine species inhabit the backwater at one time or another, more than recorded for any other area. Reasons more than recorded for any other area. Reasons were sought for this diversity. Surface plankton was sampled from head of the estuary to mouth seasonally. There were large seasonal changes in salinity due to monsoonal flooding and associated changes in species composition. Species diversity was highest during the dry season and lowest in the wet. Perhaps this annual catastrophic flooding leads, in the long run to high species diversity by leads, in the long run, to high species diversity by imposing a regular check on interspecific competition. The genera morphology was studied; the feeding appendages of the genus Acartiella differ significantly from those of Acartia suggesting that the two genera are not closely related and have distinctly different niches. The species varied in relative frequency from site to site and season to season, in accordance with a definite pattern. Some are true estuarine species while others are stenohaline marine. There is almost complete coexistence between Acartia bilobata and a southwelli and little obvious ecological differentiation. Some species coexist with considerable niche overlap. (Jones-Wisconsin) W72-07939

FOOD QUALITY AND ZOOPLANKTON NUTRI-

Oxford Univ. (England). Dept. of Zoology. James E. Schindler.

Journal of Animal Ecology, Vol 40, No 3, p 589-595, 1971. 2 fig, 3 tab, 30 ref.

Descriptors: *Zooplankton, *Foods, Daphnia, Copepods, Algae, Nutrient requirements, Cyanophyta, Chlorophyta, Phytoplankton, Graz-

Identifiers: Daphnia longispina, Diaptomus gracilis, Cyclops strenuus, Ingestion rates, Assimilation efficiences, Cryptomonas, Ankistrodesmus, Elakotothrix, Oscillatoria, Anabaena, Microcystis, Tribonema, Aphanizomenon, Oocystis, Gloeocystis, Coelastrum, Asterionella, Cryptomonas.

Food supply has been considered among the possi-ble factors leading to seasonal changes in zooplankton populations and a quantitative deter-mination of the degree of nutrition that can be sup-plied by different foods permits a very rapid as-sessment of ingestion and assimilation rates. In an attempt to determine the amounts as well as kind of food ingested and assimilated by three species of zooplankton, Daphnia longispina, Diaptomus gracilis, and Cyclops strenuus, C-14 was used to label 11 different types of algae. Freshly collected zooplankton was preconditioned in the dark at a constant temperature of 15C and with the food type to be used in the experiments. Only the larger adult females without eggs were selected. In general this work tests the relationship between some crude measure of phytoplankton concentra-tion and some measure of zooplankton density. The results show how food quality affects the assimilation and ingestion rates of zooplankton. A relationship was found between the ingestion rates and assimilation efficiencies of Diaptomus. The ecological implications of the relationship between food quality and zooplankton nutrition are discussed. (Jones-Wisconsin) W72-07940

KINETICS OF SYNTHESIS OF NITROGENASE IN BATCH AND CONTINUOUS CULTURE OF ANABAENA FLOS-AQUAE, Queen's Univ. Kingston (Ontario), Dept. of Chemical Engineering.

Archiv fur Microbiologie, Vol 80, No 3, p 242-251, 1971. 2 fig, 3 tab, 28 ref.

Descriptors: *Nitrogen fixation, *Synthesis, *Cultures, *Nitrogen, Oxygen, Biochemistry, Inhibitors, Algae, Proteins.
Identifiers: *Anabaena flos-aqua, *Nitrogenase activity, Oxygen inactivation.

Bacterial nitrogenases are oxygen sensitive and can be separated into two fractions, an iron-molybdenum-protein and an iron-protein. For a few aerobic facultative nitrogen-fixing bacteria, the iron-protein is oxygen sensitive. Nitrogenase of Anabaena flos-aquae was inactivated by oxygen and recovery of activity was measured in batch and iron, phosphate and urea-limited continuous and iron, phosphate and urea-limited continuous cultures. A flos-aquae was shown to actively synthesise new nitrogenase components after oxsynthesise new nitrogenase components after oxygen inactivation. In batch culture, canavanine, chloramphenicaol, methylamine, proflavine, puromycin and urea inhibited the recovery process. A flos-aquae growing at a dilution rate of 0.03 per hour has 180% the specific activity of nitrogenase compared to phosphate-limited cells which suggest that phytoflavin might be active in A flos-aquae. The kinetics of oxygen inactivation of nitrogenase of iron and phosphate-limited A flos-aquae are the same and all these pieces of evidence indicate that the oxygen sensitive site is a nitrogenase com-ponent. The rate of recovery of nitrogenase activi-ty in continuous cultures was dependent on light intensity, concentration of urea, ammonium salts and nitrate, and independent of growth rate. Steady-state nitrogenase activities seem to be maintanined by balancing nitrogenase synthesis and inactivation processes. (Jones-Wisconsin)

WATER QUALITY AND PLANKTON ECOLO-GY--THE CHRISTINA RIVER, DELAWARE,

Delaware Univ., Newark. Dept. of Biological Sciences; and Delaware Univ., Newark. Dept. of Civil Engineering.

M. S. Shane, E. De Michele, and R. Cannon.

Environmental Pollution, Vol 2, No 2, p 81-95,

1971. 4 fig. 8 tab. 9 ref.

Descriptors: *Water quality, *Plankton, *Ecology, Delaware River, Water pollution effects, Tidal effects, Biochemical oxygen demand, Dissolved oxygen, Headwaters, Chlorides, Ammonia, Nitrites, Nitrates, Carbon dioxide, Temperature, Turbidity, Hardness (Water), Alkalinity, Phosphorus, Nitrogen, Iron, Bacteria, Phosphates, Carbon, *Polaware*

Identifiers: *Christina River (Dela), River mouth, Zinc, Lead, Limiting nutrients.

The Christina River was studied to correlate physical-chemical characteristics during summer lowcal-chemical characteristics during summer low-flow period with plankton growth. Rising in Chester County, Pennsylvania, it crosses into Maryland and then into Delaware through a rapidly growing county before its confluence with the Delaware River. Analyses were performed at 11 sampling stations covering 51.5 kilometers of this partially tidally affected river. Although or-canic leadings were low (bischamical caveage dethis partially totally affected river. Atthough of-ganic loadings were low (biochemical oxygen de-mand less than 10 mg/1) increasing dissolved ox-ygen deficits (0.5 mg/1 at the headwaters versus 5.0 near river mouth), increasing chloride levels (up to 70 mg/1 downstream), and ammonia-, nitrite-, and nitrate-nitrogen data for the river's lower two-thirds were typical of a degraded water course. Plankton counts, low at all stations, in-creased with distance downstream (396/1 at station 1 to 228,000 at station 11). Free carbon dioxide 1 to 228,000 at station 11). Free carbon dioxide concentrations increased steadily from an average 1.4 mg/1 in the upper 4 stations to 8-9.5 at station 11. Luxurious growth of Plectonema boryanaum, using carbon dioxide saturated filtered media from each station, demonstrated the possibility that the limiting plankton growth factor in the Christina River may be low carbon concentrations. (Jones-Wisconsin)

ACETYLENE-ETHYLENE ASSAY FOR NITROGENASE ACTIVITY IN KEYSTONE RESERVOIR OKLAHOMA, Oklahoma State Univ., Stillwater.

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W. Hall, Jr.
MS thesis, July 1971. 39 p. 2 tab, 5 fig, 34 ref.
OWRR A-012-OKLA (2).

Descriptors: *Nitrogen fixation, *Analytical techniques, Temperature, Light, Detritus, Nitrogen compounds, On-site investigations, Nitrogen, Cyanophyta, *Oklahoma.

Identifiers: *Nitrogenase activity, *Acetylene-ethylene assay, Transparency, Ethylene, Arkansas River (Okla), Key-tone Reservoir (Okla), Cimarron River (Okla).

Determinations of temperature, light intensity, and different forms of nitrogen were made at four stations on the Arkansas River-Keystone Reserstations on the Arkansas Říver-Keystone Reservoir system. These analyses were supplemented by determinations of transparency by Secchi disks and an appraisal of algal population, including largely Volvocales, Euglenales, and diatoms. No significant acetylene reduction by surface particulate matter larger than 0.45 microns was detected. The high concentration of inorganic nitrogen and the absence of heterocystous blue-green algae apparently precluded the nitrogenase activity. The paucity of phytoplankton during periods of high inflow is attributed to the rapid rate of water exchange. (Wilde-Wisconsin)

STUDIES ON THE HILL REACTION OF MEMBRANE FRAGMENTS OF BLUE-GREEN ALGAE I. STABILIZING EFFECT OF VARIOUS MEDIA ON THE 2,6-DICHLOROPHENOL INDOPHENOL-HILL ACTIVITY OF MEMBRANE FRAGMENTS OBTAINED FROM ANABAENA CYLINDRI CA AND ANABAENA VARIABILIS, Tokyo Univ. (Japan). Ocean Research Inst. Y. Fujita, and R. Suzuki.
Y. Fujita, and R. Suzuki.
Plant and Cell Physiology, Vol 12, No 4, p 641-651, 1971. 6 fig, 3 tab, 14 ref.

Descriptors: *Photosynthesis, *Biological membranes, *Cyanophyta, *Cytological studies, Cultures, Carbohydrates, Incubation, Magnesium, Light intensity, Chlorophyll, Euglens, Biochemis-

try, Ions. Identifiers: *Hill activity, *Anabaena cylindrica, Anabaena variabilis, Plastocyanin, Cytochrome 553, EDTA, 2,6-dichlorophenol indophenol.

Studies of blue-green algal photosynthetic apparatus show that membrane fragments of Anabaena variabilis resemble chloroplasts of higher plants. A marked difference in stabilities of the Hill reaction systems of two Anabaena cells led to simultaneous reinvestigation of membrane fragment properties of Anabaena cylindrica and A variabilis. Activities for this reaction were stable in the two algal preparations only when prepara-tions were suspended in medium containing high concentrations of carbohydrates or PEG. Required concentrations of carbohydrates or PEG differed, 1.5 molar sucrose or 20% PEG for A cylindrica and 0.3 molar sucrose or 6% PEG for A variabilis; activities decreased below these concentrations. In both preparations, stabilizing effects, on a molar basis, varied in different solutes. A simple relation was found between effects and A simple relation was found between effects and water concentrations of media. In media free of carbohydrate or PEG, magnesium ions were moderately stabilizing; EDTA acted antagonistically to magnesium. In the media containing carbohydrate or PEG, their actions were insignificant. Results suggest that the molecular organization in membranes necessary for Hill reaction is easily destroyed under high water concentrations. easily destroyed under high water concentrations, and that added solutes stabilize the activity by reducing water concentrations. (Jones-Wisconsin)

W72-07946

CHEMICAL LIMNOLOGY OF A DEVELOPING RESERVOIR (LAKE MEREDITH) IN THE TEXAS PANHANDLE, West Texas State Univ., Canyon. W. A. Cooper, R. S. Hestand, III, and C. E.

The Texas Journal of Science, Vol 23, No 2, p 241-251, 1971. 4 fig, 7 tab, 10 ref.

Descriptors: *Physical properties, *Chemical properties, *Reservoirs, Limnology, *Texas, Conductivity, Hardness (Water), Dissolved solids, Dissolved oxygen, Sodium, Temperature, Chlorides, Sulfates, Potassium, Volume, Thermocline, Oxygen, Alkalinity, Hydrogen ion concentration. Identifiers: *Lake Meredith (Texas).

The sparcity of limnological data for reservoirs in Texas prompted determination of continuing chemical data for Lake Meredith, an impoundment on the Canadian River in the Texas panhandle. The physical and chemical history of the water of the lake from the closure of the dam in February 1965, until the last of December 1968, is presented. Watershed data and tabular and graphic depictions of specific conductance, total hardness, total dissolved solid, dissolved oxygen, temperature, chlorides, sulfates, sodium-potassium and volume are given. Thermocline formations occured during March and remained until late September or early October each year. Lake volume increase was spasmodic with major inflows in 1965 and 1967. The volume (300,000 acre-feet), as of December 31, 1968, represents less than half the total capacity of the reservoir. Sodium-potassium, chlorides, and sulfates showed steady increases from less than 100 mg/liter to near 250 mg/liter during the 4-year period. Increases in total hardness total discoluted solids and energific conduring the 4-year period. Increases in total hardness, total dissolved solids, and specific conductance are given. Increase in mineral constituents appeared to be from leaching and solution of geological formations in the lake bed and walls. (Jones-Wisconsin) W72-07947

MICROBIOLOGICAL STUDIES ON NITROGEN FIXATION IN AQUATIC ENVIRONMENTS--IV. ON THE NITROGEN FIXING BACTERIA IN CULTURE PONDS, Kyoto Univ. (Japan). Research Inst. for Food Science; and Mie Tsu (Japan), Prefectural Univ. Faculty of Fisheries.

A. Kawai, M. Sugiyama, and I. Sugahara. Bulletin of the Japanese Society of Scientific Fisheries, Vol 37, No 10, p 986-991, 1971. 6 tab.

Descriptors: *Nitrogen fixation, *Nitrogen fixing bacteria, Ponds, Nutrients, Bottom sediments, *Eutrophication, Nitrogen compounds, Dissolved oxygen, Hydrogen ion concentration, Chemical oxygen demand, Photosynthesis, Cyanophyta. Identifiers: *Fish culture ponds, *Heterotrophic bacteria, Gotenba (Japan), Ueda (Japan), *Japan.

bacteria, Gotenba (Japan), Ueda (Japan), "Japan.

The occurrence of nitrogen fixing bacteria in fish culture ponds, where the nutrient content and total heterotrophic bacterial population were high, is reported. Two culture ponds near Gotenba City, Japan, two near Ueda, and a eutrophic natural, small, shallow pond used as a control near Kyoto University, were investigated. The ratio of total heterotrophs to that of nitrogen fixing bacteria was usually about 10,000 in the culture ponds. It indicates that the standing crop of nitrogen fixing bacteria in the ponds is generally extremely small as compared with other water regions, even though they occur rather abundantly in culture pond bottom sediments. In the control pond, nitrogen fixing bacteria were very abundant in the water and sediments. Nitrogen fixing bacterial number fluctuates considerably through the year. Heterotrophs standing crop in the control was similar to that in culture ponds in both water and bottom sediments. The number of nitrogen fixing bottom sediments. The number of nitrogen fixing bacteria in the control pond water was extremely large as compared with that in culture ponds. A

diurnal change in number of the bacteria was not observed in spite of considerable fluctuation of the physical environment. (Jones-Wisconsin) W72-07948

INTRAZOOPLANKTON PREDATION BY MESOCYCLOPS EDAX AT NATURAL PREY

MESOCYCLOPS EDAX AT NATURAL PREY DENSITIES, Ithaca Coll., N.Y. Dept. of Biology. John L. Confer. Limnology and Oceanography, Vol 16, No 4, p 663-666, 1971. 1 fig, 1 tab, 12 ref.

Descriptors: *Zooplankton, *Predation, *Density, Copepods, Lakes, Standing crop, Herbivores, Biological communities, Carnivores, Daphnia, *Florida.

Identifiers: *Mesocyclops edax, Diaptomus floridanus, Selective predation, Swan Lake (Clay County, Fla).

Predation by zooplankton on zooplankton is a common feature of planktonic communities and could affect the herivorous zooplankton both quantitatively and qualitatively. The qualitative significance of intrazooplankton predation depends on the selectivity of predation by zooplankton. High rates of such predation would have a strong influence on the herbivorous zooplankton composition. Samples were taken from Swan Lake in the southwest corner of Clay County, Florida, in the sandhills region. The lake is part of the perched water table exposed by slumps in calcareous bedrock. Predation by Mesocyclops edax on Diatomus floridanus was studied; skill in distinguishing naturally dead from killed Diaptomus and precautions for pipetting were refined throughout guishing naturally dead from killed Diaptomus and precautions for pipetting were refined throughout the study. Selective predation on Diaptomus copepodites rather than cladocerans was strong. Observed feeding rates on Diaptomus copepodites at lake densities varied from 0.07-1.30 prey/predation per day. Maximum estimates of in situ predation rate for two lakes with similar species composition were 1 and 6% of the standing crop of copepodites/day. The highly selective predation and rate of predation are considered sufficient to greatly influence species and size composition of the herbivores. (Jones-Wisconsin) W72-07949

ALIGICIDAL NONFRUITING MYXOBACTERIA WITH HIGH G + C RATIOS,
Texas Univ. Medical School, San Antonio. Dept.
of Biochemistry; and North Carolina Univ.,
Chapel Hill. Dept. of Botany.
J. R. Stewart, and R. M. Brown, Jr.
Archiv fur Microbiologie, Vol 80, No 2, p 176-190,
1971. 6 fig, 2 tab, 52 ref. FWQA Program 18050
DBR.

Descriptors: *Algal toxins, *Myxobacteria, Chlorophyta, Cyanophyta, Systematics, Vitamins, Anaerobic bacteria, Electron microscopy, Pigments, Carbohydrates, Proteins, Actinomycetes,

Identifiers: *G + C ratios, *Nonfruiting myxobacteria, DNA, Motility, Cyst formation, Antibiotic sensitivity, Cytophaga johnsonii, Sporocytophaga myxococcoides.

Bacteria which kill algae have been reported on gliding organisms in the order Myxobacterales of fruiting and nonfruiting groups but only the latter appears to contain organisms known to kill both green and blue-green algae. Deoxyribonucleic acid base ratios are generally agreed to be in the 70's for fruiting myxobacteria and in the 30's for nonfor fruiting myxobacteria and in the 30's for non-fruiting. A few nonfruiting myxobacteria with high G + C ratios have been reported. Five nonfruiting myxobacteria with G + C ratios ranging from 69-71 mole percent, three being new isolates and two obtained elsewhere are reported. These base ratios of the deoxyribonucleic acids of these algicidal myxobacteria were determined by thermal denatu-ration temperatures; no unusual nucleic acid bases were detected. These organisms are described as amicro-cystogenous, gliding, Gram-negative bacil-

Group 5C-Effects of Pollution

li capable of degrading gelatin, casein, starch, cel-lulose, chitin, and alginate. All have been shown to be algicidal. Poly-beta-hydroxybutyrate in each be aggicial. Poly-ocu-nyoroxyoutytate in each was indicated by conversion to crotonic acid. Antibiotic sensitivity was similar to that of known nonfruiting myxobacteria. Fine structure of one, Myxobacter 44, revealed a triple-layered cellular envelope whose middle layer is lysozyme sensi-tive. Ruthenium red-positive slime material ad-hered to the outer surface. (Jones-Wisconsin)

CHEMICAL INVESTIGATION THE RECENT LAKE SEDIMENTS FROM WISCON-SIN LAKES AND THEIR INTERPRETATION. Wisconsin Univ., Madison.

Gilbert C. Bortleson

Available from NTIS as PB-208 965, MF\$0.95 and also available from SOD EP2. 10:16010HR03/71 \$2.25. Environmental Protection Agency, Water Pollution Control Research Series, March 1971. 278 p. 35 fig, 36 tab, 198 ref, 2 append. EPA Program 16010 EHR 03/71.

Descriptors: *Sediments, *Lakes, *Chemical anal-ysis, Stratigraphy, Cores, Lake soils, Evaluation, Sedimentary petrology, Wisconsin, Eutrophica-tion, Chemical stratification, Nutrients, Inorganic compounds, Nitrogen, Phosphorus, Carbon, Calcium, Magnesium, Potassium, Aluminum, Iron, Manganese

Identifiers: *Calcareous lakes, *Noncalcareous lakes, Lake Mendota (Wis), Madison lakes (Wis), Post cultural lake sediments, Precultural lake sedi-

ments, Organic carbon.

To trace the effects of cultural eutrophication, one meter sediment cores were used to determine the history of calcareous and noncalcareous Wisconsin lakes. Cores were analyzed for carbon, phosphorus, calcium, magnesium, potassium, alu-minum, iron, and manganese. Determinations of organic nitrogen, exchangeable ammonium and acid soluble phosphorus were made on selected sedimentary profiles. Recent sedimentation rates and identification of pre- and postcultural sediments were determined by ragweed pollen. Enrichment of phosphorus in post cultural Lake Mendota, Wisconsin, sediments is not only the effect of increased phosphorus supply from domestic sewage but also due to increase in phosphorus retentive capacity of postcultural sediment and increase of phosphorus deposition due to concomitant increase of iron, manganese, potassium, and aluminum-containing compounds. Evidence indicates long, stable conditions existed in this lake and watershed prior to human habitation, when phosphorus deposition rate multiplied 5-8 times over the precultural interval. Phosphorus concentration is largely controlled by iron and to a lesser extent by manganese deposition. Chemical stratigraphy of concentration-depth diagrams permit a qualitative evaluation of cultural activities. Potentialities and limitations of using recent lake sediments to evaluate eutrophication are discussed. (Auen-Wisconsin) W72-07952

PHYSICOCHEMICAL PROPERTIES OF THE WATER OF REED-BELTS IN MIKOLAJSKIE, TALTOWISKO, AND SNIARDWY LAKES,

Polish Academy of Sciences, Warsaw. Dept. of Applied Limnology; and Polish Academy of Sciences, Warsaw. Inst. of Ecology. M. Planter.

Polish Archives of Hydrobiology 17 (3): 337-356. 1970. Illus.

*Eutrophication, Descriptors: Lakes. *Physicochemical properties, Epilimnion.
Identifiers: *Mikolajskie Lake, *Poland, *Reedbelts, *Sniardwy Lake, *Taltowisko Lake.

The chemical composition of water in reed-belt profiles of eutrophic, mezotrophic and polymictic lakes was studied. The chemical mechanism of the waters of open reed-belt having contact with the mid-lake water undergoes similar seasonal changes as the epilimnion.—Copyright 1972, Biological Abstracts, Inc.

GROUNDWATER CONTAMINATION BY ROAD SALT: STEADY-STATE CONCENTRA-TIONS IN EAST CENTRAL MASSACHUSETTS, Brandeis Univ., Waltham, Mass. Environmental Studies Program. Studies Program.
For primary bibliographic entry see Field 05B.
W72-07962

ECOLOGICAL ASPECTS OF SELECTED CRUSTACEA OF TWO MARSH EMBAYMENTS OF THE TEXAS COAST,
Texas A and M Univ., College Station. Dept. of Biology and Agricultural Extension Service. For primary bibliographic entry see Field 02L. W72-08046

PHYSIO-MORPHOLOGICAL EFFECTS OF ABRUPT THERMAL STRESS ON DIATOMS, Virginia Polytechnic Inst., Blacksburg. Dept. of Zoology. Guy R. Lanza.

PhD thesis, August 1971. 65 p, 8 fig, 11 tab, 44 ref. OWRR-B-017-VA (3).

Descriptors: *Diatoms, *Thermal stress, *Thermal pollution, Temperature, Analytical techniques, Cultures, Fluorometry, Powerplants, Pigments, Bioluminescence, Water pollution effects, Cytological studies, Chrysophyta, Fluorescence. Identifiers: *Temperature shock, *Physio-prophological studies, Cellular fluorescence nature. morphological studies, Cellular fluorescence pat-terns, Sub-lethal alterations, Lipid fluorescence, Steam condenser cooling lines

Stresses, designed to simulate abrupt temperature shocks which could result from entrainment through cooling lines of electric power generating facilities and downstream thermal effluent additions, were studied. Physio-morphological effects of several categories of defined abrupt temperature increases on diatoms were evaluated. Au-tecological and synecological studies involving various ambient temperatures and culture conditions were examined. Populations were maintained in laboratory culture at three ambient temperatures within optimum growth range of the species, and subjected to various categories of thermal stress. Other populations growing at 20C were prestressed by maintenance in sub-optimal culture and exposed to added stress of temperature in-. Synecological studies on diatoms from field collections under various normal and sub-optimal culture maintenance were carried out for comparison with single species populations. Cell condition and effects on population growth were studied by microscopic surveys. A new criterion involving autofluorescence of metalloporphyrins and induced fluorescence of 3,4 Benzpyrene-Caffeine fluorochromed lipid was investigated as a reme Huorochromed lipid was investigated as a technique in measuring physio-morphological cellular alterations following thermal stress. Changes in cellular fluorescent patterns prior to, and following severe internal diatom destruction are discussed along with certain ecological and physiological implications. (Jones-Wisconsin) W72-08047

INTERACTIONS OF DISSOLVED AND PARTICULATE NITROGEN IN LAKE METABOL-ISM.

ISM,
Michigan State Univ., Hickory Corners. W. K.
Kellogg Biological Station; and Michigan State
Univ., Hickory Corners. Dept. of Botany and
Plant Pathology.

Bruce A. Manny. PhD thesis, 1971. 189 p, 32 fig, 7 tab, 268 ref. B-009-MICH (2)

Descriptors: *Nitrogen, *Lakes, Analytical techniques, Michigan, Seston, Algae, Phytoplank-

ton, Nannoplankton, Ammonia, Nitrates, Nitrites, ton, Nannopiankton, Ammonia, Nitrates, Nitrate,
Hardness (Water), Nitrogen cycle, Organic
matter, Photosynthesis, Eutrophication,
Phosphorus, Chlorophyta, Cyanophyta,
Chrysophyta, Euglenophyta, Dissolved oxygen,
Carbon, Lake morphometry, Chemical properties, Carbon, Lake morphometry, Chemical properties, Oxygen, Chlamydomonas, Aquatic plants, Zooplankton, Daphnia, Sediments, Conductivity, Bacteria, Pseudomonas, Nitrogen compounds. Identifiers: *Lake metabolism, *Dissolved organic nitrogen, *Particulate organic nitrogen, Calcareous lakes, Ultra-violet labile nitrogen, Ultra-violet refractory nitrogen, Netplankton, Lawrence Lake (Mich), Wintergreen Lake (Mich), Carbonate par-ticles, Phosphorus cycle.

To compare rates of allochthonous nitrogen entry, rates of nitrogen regeneration and organic nitrogen production, two lakes, representing extremes of hardwater, were sampled weekly. Measurements of dissolved ammonia, nitrite, and nitrate for 22 months and organic nitrogen for 12 months were made and seasonally in four other lakes representing chemical and trophic spectrum in glaciated Michigan. Seston at 1 m depth was fractionated weekly for 14 months; net and nanno fractions analyzed. Seasonal changes in all nitrogenous parameters were related to changes in 15 other chemical and biological parameters assayed simultaneously. Nannophytoplankton contain more nitrogen per unit cell volume than netphytoplankton. Dissolved organic nitrogen compounds at natural concentrations were measured and UV-la-bile fraction differentiated from UV-refractory fraction within the nitrogen pool in six lakes. Measurements of allochthonous dissolved organic nitrogen entering the most calcareous lake in spring revealed the two fractions entered the lake. The most calcareous lake revealed the UV-refrac-The most calcareous lake revealed the UV-retractory fraction originated largely in the surrounding watershed, whereas the UV-labile fraction originated largely within the lake. Pelagic dissolved organic nitrogen interactions seem to explain how aquatic photosynthesis in hardwater lakes is regulated. Eutrophication rates stemming from various combinations of these interactions are discussed. (Jones-Wisconsin)

EFFECTS OF LOW NUTRIENT DILUTION WATER AND MIXING ON THE GROWTH OF NUISANCE ALGAE, Washington Univ., Seattle. James A. Buckley.
MS thesis, 1971. 116 p. 54 fig, 20 tab, 33 ref, 3 append. OWRR A-034-WASH (3).

Descriptors: *Algal control, *Diffusion, *Nutrients, *Nuisance algae, Washington, Phytoplankton, Cyanophyta, Nitrates, Phosphates, Lakes, Stratification, Mixing, Bottom sediments, Succession, Chlorophyta, Diatoms, Chlorophyll, Alkalinity, Carbon dioxide, Temperature, Dissolved oxygen, Hydrogen ion con-centration, Scenedesmus, Biomass. Identifiers: *Moses Lake (Wash), Nutrient dilu-tion, Limiting nutrients, Algal cell washout.

The purpose of the dilution experiments was to study the effect of low nutrient dilution water on growth in situ. Of primary interest was the possibility of changing the algal community struc-ture from predominately blue-green algae to a community dominated by less obnoxious forms by adding low nutrient water to the lake. Additional dilution experiments, employing nutrient addi-tions, were designed to relate observed algal growth changes to dilution of nitrogen or phosphorus at growth limiting levels. The experiments, conducted in Moses Lake, Washington, from June through September 1970, showed that dilution resulted in reduction of the yield and growth rate of blue-green algae without increasing or decreasing the abundance of other algal forms. Nitrate was found to stimulate only blue-green algal growth when added to the dilution water while additions of orthophosphate generally had no effect. In situ experiments were also conducted mixing on algal growth. Results indicate when the lake is stratified and conditions are aerobic the water near the bottom has the greatest algal growth potential. During lake mixing results may be unpredictable. (Jones-Wisconsin) W72-08049

EUTROPHICATION AND THE OXYGEN ECONOMY OF STREAMS, Pennsylvania State Univ., University Park. Dept. of Civil Engineering. Archie J. McDonnell.

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een ter Proceedings 31st International Water Conference, Pittsburgh, Pennsylvania, October 27-29, 1970, p 3-8. Pennsylvania State University Institute for Research on Land and Water Resources Reprint Series No 25. 7 fig, 2 tab, 15 ref. OWRR A-003-PA

Descriptors: *Eutrophication, *Aquatic plants, *Streams, *Dissolved oxygen, Mathematical models, Biochemical oxygen demand, Respiration, Reaeration, Photosynthesis, Estimating equations, Water pollution effects, Water pollution control, Pennsylvania. Identifiers: *Oxygen sinks, Spring Creek (Penn).

The possible impact that eutrophic conditions can have on the dissolved oxygen resources of receiv-ing streams is demonstrated. Quantitative estiing streams is demonstrated. Quantitative estimates of dissolved oxygen variations in these systems are based on mass balance of prevalent sources and sinks of oxygen. Steady-state models to accommodate these components are documented. Estimates of the rates of photosynthetic, community respiration and reaeration are made utilizing observed diurnal dissolved oxygen variation curves. The method allows for an in situ detertion curves. The method allows for an in situ determination of the reaeration coefficient. A case of oxygen liability is demonstrated in Spring Creek watershed (Central Pennsylvania). Dissolved oxwatershed (Central Pennsylvania). Dissolved oxygen profiles were calculated as follows: observed oxygen levels with present sewage treatment plant discharge and all sinks operative; calculated oxygen levels with sewage treatment plant discharge and carbonaceous, nitrogenous and benthal demands eliminated; and calculated oxygen levels, under conditions similar to the last, with a 50% plant growth reduction. Renovation to acceptable dissolved oxygen levels will require plant biomass reduction. Proposed treatment measure should be reduction. Proposed treatment measure should be directed toward this objective. Utilization of diag-nostic procedures to identify and quantify those parameters directly affecting dissolved oxygen, can establish whether photosynthetic forms are fortuitous or detrimental and consequently developing rational criteria for water resource management. (Jones-Wisconsin) W72-08050

ARE SOME BACTERIA TOXIC FOR MARINE

ARE SOME BACKERS.

Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.

B. R. Berland, D. J. Bonin, and S. Y. Maestrini.

Marine Biology, Vol 12, p 189-193, 1972. 4 fig, 1

Descriptors: *Bacteria, *Toxicity, *Marine algae, Sea water, Chlorophyta, Chlamydomonas, Laboratory tests, Chrysophyta, Optical proper-

Identifiers: *Antibiosis, Optical density. Prasinophyceae, Xanthophyceae, Flavobacteria. Baccilariophyceae, Achromobacter, Vibrio,

Algal and bacterial environment in the sea is not only ruled by a simple trophic relationship, but an-tibiosis may also play an important role in marine ecology. In vitro experiments were carried on with 13 algal species, 20 bacterial strains, and three bac-terial undetermined strains isolated from algal cultures. Experiments revealed an obvious inhibition of several marine algae by some bacteria. Pseudomonas aeruginosa and related strains are not marine organisms, but they can be transported to the sea. Insofar as there is no quantitative similarity between in situ and culture densities of bacterial populations, bacterial poisons may only be important when concentrated; for example, in narrow waters rich in suspended or dissolved organic matter. The in vitro experiments indicate that the pigmented poison of the bacterium Pseudomonas aeruginosa is a strong growth inhibitor of the alga Tetfaselmis striata. Several bacteria strains from different origins are recognized to have the same Tetraselmis striata. Several bacteria strains from different origins are recognized to have the same toxicity against various marine algae. Taking into account the very great differences between in vitro experiments and in situ environmental conditions, it is not at present possible to state that bacterial poisons really play a role in the algae-bacteria relationships in the sea. (Jones-Wisconsin) W72.0803.

NITROGEN FIXATION BY BACTERIA IN LAKE MIZE, FLORIDA AND IN SOME LACUS-TRINE SEDIMENTS,

Florida Univ., Gainesville. Dept. of Environmen-

tal Engineering.
M. A. Keirn, and P. L. Brezonik.
Limnology and Oceanography, Vol 10, No 5, p
720-731, 1971. 5 fig, 6 tab, 25 ref.

Descriptors: *Nitrogen fixation, *Bacteria, *Florida, *Sediments, Lakes, Clostridium, Depth, Temperature, Dissolved oxygen, Nutrients, Eutrophication, Oligotrophy, Stratification, Hypolimnion, Ammonia, Nitrates, Conductivity, Chemical oxygen demand, Nitrogen fixing bacteria, Photosynthetic bacteria, Anaerobic conditions, Epilimnion, Hydrogen sulfide. Identifiers: *Lake Mize (Fla), Anoxic environments, Acetylene reduction, Thiospirillum, Chromatium, Guatamala, Heterotrophic bacteria.

The acetylene reduction technique was used to measure nitrogen fixation in the water column of Lake Mize, Florida, a highly colored, small, deep lake, and in a variety of lacustrine sediments. A consistent seasonal and vertical pattern of fixation occurs in Lake Mize with positive rates noted only for a relatively short period during summer stratification and only in the anoxic hypolimnion. Maximum rates (up to an equivalent of 3.26 micrograms nitrogen per liter-hour) were at depths of 5-10 meters. Three bacterial cultures capable of fixing N were isolated from the waters: a heterotroph ing N were isolated from the waters: a heterotroph characteristic of the genus Clostridium and the purple sulfur bacteria Thiospirillum and Chromatium. Evidence suggests that fixation is primarily heterotrophic. In seven out of 25 Florida lakes and from 3 Guatemala lakes, acetylene reduction was from 3 Guatemala lakes, acetylene reduction was detected in sediments. Rates decreased with depth in 30-50 cm cores. Acetylene reduction was stimulated by high concentrations of sucrose in lake sediment, but not by glucose, acetate, butyrate, and pyruvate. Bacterial fixation in aquatic-environments is more widespread and significant than previously thought. (Jones-Wisconsin) W72-08052

NITROGEN FIXATION IN LAKE ERKEN, Uppsala Univ (Sweden). Inst. of Limnology. U. Granhall, and A. Lundgren. Limnology and Oceanography, Vol 16, No 5, p 711-719, 1971. 8 fig, 3 tab, 26 ref.

Descriptors: *Nitrogen fixation, *Algae, Measure-ment, Cyanophyta, Phytoplankton, Photosynthes-is, Primary productivity, Eutrophication, Solar radiation, Distribution, Depth, Diurnal, Seasonal. Identifiers: *Lake Erken (Sweden), *Dark

nitrogen fixation.

To determine seasonal nitrogen fixation by plank-tonic algae in the whole pelagial of a lake and esti-mate its importance in relation to other sources of combined nitrogen, Lake Erken, east of Uppsala, unpolluted and moderately eutrophic, was studied. In situ fixation of molecular nitrogen was measured in 1970 by the acetylene reduction technique every two weeks during five months. Samples

were taken from 20 randomly distributed stations. Subsamples were withdrawn for nitrogen fixation experiments, primary production measurements, algal counts or chemical analyses. The algal diurnal cycles and vertical distribution were investigated. Fixation was correlated with the presence of heterocystous blue-green algae, especially Aphanizomenon, in the phytoplankton, and was light dependent, though appreciable dark fixation of photosynthetic products formed during previous light periods. Annual contribution of nitrogen fixation in the pelagial was around 0.5 g N/sq m. Highest values were obtained before mass development of Aphanizomenon and maximal primary production. Highest nitrogenase activity was shown in the first algal development period. Contribution of easily available combined nitrogen by pelagic nitrogen fixation increases annual combined nitrogen loading by 40% and is important. (Jones-Wisconsin)

THE DISTRIBUTION OF UREA IN COASTAL AND OCEANIC WATERS, Woods Hole Oceanographic Institution, Mass. C. C. Remsen.
Limnology and Oceanography, Vol 16, No 5, p 732-740, 1971. 5 fig, 3 tab, 19 ref.

Descriptors: *Distribution, *Ureas, *Coasts, *Oceans, Surface waters, Continental shelf, Depth, Nitrogen, Phytoplankton, Hydrography, Nitrites, Nitrates, Ammonia, Algae, Chlorella. Identifiers: *Coastal waters, Panama, Callao (Peru), Cape Cod (Mass), Cape May (N J), Sargas-

It has been suggested that urea should be considered a part of the nitrogen reserve in coastal waters and perhaps in oceanic waters as well. The distribution was determined for certain coastal and oceanic waters, as follows: Urea-nitrogen in surface waters off the continental shelf between Panama and Callao, Peru, was extremely patchy and varied in concentration from 0.54 to 5.00 microgram-atom urea-N/liter. Higher values were senerally from samples collected within a foam microgram-atom urea-N/liter. Higher values were generally from samples collected within a foam slick or windrow. Surface waters in nonupwelling waters north of Callao averaged 1.83 microgramatom urea-N/liter while surface waters in upwelling waters south of Callao averaged 3.46. Along the continental shelf of the northeast United States between Cape Cod and Cape May, the concentration of urea ranged from 0.25 micrograma om urea-N/liter on the 1000 fathom (1830 meter) line to a high of 11.20 within New York Harbor. The vertical distribution of urea in Peruvian waters, along the northeast United States, and Sargasso Sea fluctuated considerably with depth but there were indications of peaks. The sug-Sargasso Sea Inectuated considerably with depth but there were indications of peaks. The suggestion that urea may serve as an available source of nitrogen for phytoplankton growth is supported. (Jones-Wisconsin) W72-08056

CHANGE OF THE PREFERRED TEMPERA-TURES OF CERTAIN SPECIES OF STURGEON AT DIFFERENT LEVELS OF FOOD SATIA-TION (IZMENENIE PREPOPOCHITAEMYKH TEMPERATUR U NEKOTORYKH VIDOV OSETROVYKH RYB PRI RAZNOM UROVNE PISHCHEVOGO NASYSH CHENIYA), Leningrad State Univ. (USSR).

Y. Dzyan.

Trans. available from the National Technical Information Service as PB-199 801-T, \$3.00 in paper copy, \$0.95 in microfiche. Nauchnye Soobshcheniya Instituta Fiziologii, No. 1, p 125-127, 1959. 1 tab. (T. anslation from Russian distributed by Bureau of Sport Fisheries and Wildlife), Washington, D. C.

Descriptors: *Water temperature, Bioassay, *Thermal pollution, Thermal stress, Feeding rates, Water pollution effects. Identifiers: *Sturgeon, *Thermal preference, Acipenser spp, USSR.

Group 5C-Effects of Pollution

Fingerlings of sturgeon (Acipenser guldenstadti persicus and A. nudiventris) 2-3 months old were tested to determine their temperature preference after varying amounts of feeding. A modified Herter apparatus was used with a temperature gradient of 14-27 C. Beginning thirty minutes after placing fingerlings into the established thermogradient, the fish's position was noted each minute for one hour. In general, starved fry a higher one. Such a reaction is adaptive, and probably is connected with change in the level of metabolism. (LeGore-Washington) W72-08057

RESPONSES OF TELEOST FISH TO ENVIRON-

MENTAL STRESS, Washington Univ., Seattle. Fisheries Research Inst.

L. S. Smith, J. B. Saddler, R. C. Cardwell, A. J. Mearns, and H. M. Miles.

Mearns, and H. M. Miles.
Copy available from GPO Sup Doc
EP2.10:18050EBK 02/71, \$1.25; microfiche from
NTIS as PB-208 968, \$0.95. Environmental Protection Agency. Water Pollution Control Research
Series, February 1971. 114 p. 27 fig, 24 tab, 60 ref,
2 append. EPA Program 18050 EBK 02/71.

Descriptors: *Fish physiology, *Environmental effects, *Fish migration, *Salmon, *Oxygen sag, *Oxygen requirements, *Animal metabolism, Sewage, Anadromous fish, Fish behavior, Water pollution effects, Dissolved oxygen, Water quality, Bioassay, Metabolism.

A floating laboratory was built for conducting multiparameter physiological studies on salmon in marine, estuarine and fresh water. New methods were developed using a swimming chamberrespirometer for adult salmon. Normal values were measured for a variety of physiological func-tions, then repeated on salmon migrating through an urban estuary characterized by sewage pollu-tion and low dissolved oxygen. Effects included decreased swimming stamina and respiratory efficiency, decreased oxygen consumption and in-creased lactate, decreased urine flow and ammonia excretion, especially in the presence of environmental ammonia. Longer term disruptions in hematology and lipid metabolism occurred. Most of the effects occurred at dissolved oxygen con-centrations just below 5 mg/1, except for synergistic effects between ammonia and low dissolved oxygen at somewhat higher concentrations. (LeGore-Washington) W72-08058

RECLAMATION OF PONDS, LAKES, AND STREAMS WITH FISH TOXICANTS: A

REVIEW, Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.

R. E. Lennon, J. B. Hunn, R. A. Schnick, and R. M. Burress.

Food and Agriculture Org., United Nations, Fisheries Technical Paper 100, 1970. Re-printed by Bur. Sport Fisheries and Wildlife. 1971. 99 p. 296 ref.

Descriptors: "Chemcontrol, "Rehabilitation, *Piscicides, *Fish control agents, Agricultural chemicals, Water pollution sources, Pesticides, Control, Fish management, Reservoir operation, Toxicity, *Toxins, Water pollution effects.

A critical review of the world-wide use of toxicants in the reclamation of inland fishing waters is based on a review of the literature and on a widely circulated questionnaire. The eradication of undesirable fishes from public lakes and streams began over 60 years ago, but accelerated over the past two decades as wild water increasingly required fish management and as improved toxicants became available. Toxicants such as the organochlorines and organophosphates, borrowed from agriculture, are being replaced with controls that are more specific to fish or more appropriately formulated for aquatic application. Formula-tions of rotenone and antimycin are the most used, general fish toxicants in the United States; TFM is a successful selective toxicant for larval sea lampreys in tributaries of the Great Lakes; and Squaxin is in advanced stages of development as a selective toxicant for squawfishes in salmonid streams on the west coast of North America. Twenty-nine countries have apparently used or are using fish toxicants for the control of undesirable fishes. (LeGore-Washington) W72-08059

THE AGE AND GROWTH OF BROWN TROUT (SALMO TRUTTA) AND SCULPIN (COTTUS SUPP.) AS IT RELATES TO EUTROPHICATION IN THE JORDAN AND AUSABLE RIVERS, Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

M. S. thesis, 1971. 86 p. 18 fig, 18 tab, 35 ref. OWRR C-1663 (No 3153) (1) and C-2205 (No 3388)

Descriptors: *Eutrophication, *Biomass, *Bioindicators, *Trout, *Brown trout, *Sculpins, *Degradation (Stream), Aquatic productivity, Productivity, Water pollution effects, Water quality, Number fish per acre, Standing crops, Salmonids, *Michigan.

Identifiers: Salmo spp., Cottus spp., *Jordan River (Mich), *Ausable River (Mich).

Brown trout (Salmo trutta) and two species of sculpins (Cottus bairdi and C. cognatus) were collected from sites deemed to represent a gradient in stages of eutrophication. The ages of the trout were estimated by analysis of scale annuli, and sculpins were aged by otolith analysis. Growth curves were then constructed. For every species, curves were then constructed. For every species, fish of comparable age were larger in the more eutrophic streams. The population density of brown trout was 4,395/hectare in the least eutrophic site, and 887/hectare in the most eutrophic. Total trout biomass was greatest at the latter site. It is suggested that these three species might be used to identify changes in stream quality than the extreme contact of the stream contact and the suggested that these three species might be used to identify changes in stream quality through corresponding changes in the growth rate of successive year classes of underyearlings. (LeGore-Washington) W72-08060

RESPONSES OF SOME ESTUARINE FISHES TO INCREASING THERMAL GRADIENTS, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Resources; and Ichthylogical Association, Middletown, Del. J. J. Gift, and J. R. Westman. Privately published monograph. June 1971. 154 p. 8 fig, 102 tab, 83 ref, append.

Descriptors: *Water temperature, *Temperature, *Thermal pollution, *Fish behavior, *Animal behavior, *Environmental effects, Heated water, Thermal stress, Thermal water, Water pollution effects, Pollutants, Silversides, Perches, Killifishes, Striped bass, Shrimp, Crabs, Aquatic environments vironment

Identifiers: Flounder, Puffer, Bluefish, Kingfish, Seahorse, Pinfish, Jack crevalle, Pseudopluronectes spp., Sphaeroides spp., Bairdiella spp., ronectes spp., ophactoides spp., baltucita spp., Pomatomus spp., Menticirrhus spp., Menida spp., Morone spp., Fundulus spp., Cyprinodon spp., Hippocampus spp., Lagodon spp., Caranx spp., Palaemonetes spp., Callinectes spp.

The projected enormous volumes of water needed by industry for cooling purposes, and the con-comitant thermal loading, make it increasingly im-portant to characterize the thermal requirements of fishes. An experimental apparatus was designed to produce a moving thermal gradient of 2-3 F over an 18 ft long tank. It was used to determine the upper avoidance temperatures and upper avoidance breakdown temperatures of some im-portant estuarine fishes and invertebrates. These included the winter flounder (Pseudopluronectes americanus), the northern puffer (Sphaeroides maculatus), the silver perch (Bairdiella chrysura),

the bluefish (Pomatomus saltatrix), the northern the bluefish (Pomatomus saltatrix), the northern kingifsh (Menticirrhus saxatilis), the Atlantic silversides (Menidia menidia), the striped bass (Morone saxatilis), the white perch (Morone americana), the striped killifish (Pundulus majalis), the mummichog (Fundulus heteroclitis), the sheepshead minnow (Cyprinodon variegatus), the spotted seahorse (Hippocampus erectus), the pinfish (Lagodon rhomboides), the crevalle jack (Caranx hippos), the grass shrimp (Palaemonetes vulgaris), and the blue crab (Callinectes sapidus). Responses to thermal stimuli were affected by the past thermal history and the size of the organisms, and by the season of the year. (LeGore-Washington) W72-08061

CADMIUM IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL AP-PRAISAL, Karolinska Institutet, Stockholm, (Sweden). Dept.

of Environmental Hygiene.

L. Friberg, M. Piscator, and G. Nordberg.

Available from the National Technical Information Service as PB-199 795, \$6.00 in paper copy, \$0.95 in microfiche. April 1971. 314 p. 45 fig, 32 tab, 391 ref. CPA 70-30.

Descriptors: *Cadmium, *Air pollution, *Air pollution effects, *Metabolism, Metals, Public health, *Toxicity, Industrial wastes.

Identifiers: Metabolic diseases, Respiratory effects, Hematopoiesis, Gastrointestinal effects, Cardiovascular effects, Bone diseases, Carcinogens, Itai-Itai disease.

A review on cadmium is presented with a focus on the understanding of the toxic action of cadmium and the relationship between dose (exposure) and effects on human beings and animals. The following areas are discussed: occurrence of cadmium; possible routes of exposure and daily intake; possible founds of exposure and daily inflaxed metabolism of cadmium; respiratory effects and dose-response relationships; systemic effects and dose-response relationships; carcinogenic and genetic effects; and the Itai-Itai disease. (LeGore-Washington) W72-08062

THE TOXICITY OF 2,4-D AND PICLORAM HERBICIDES TO FISH,
Purdue Univ., Lafayette, Ind. Dept. of Botany and

Plant Pathology. M. Sargent, D. Blazek, J. H. Elder, C. A. Lembi,

and D. J. Morre.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-201 099, \$3.00 in paper copy, \$0.95 in microfiche. Purdue University and Indi-ana State Highway Comm. Joint Highway Research Project. Publication No. 24, October 1970. 22 p. 6 fig, 5 tab, 24 ref.

Descriptors: *Herbicides, *2-4-D, Water pollution effects, Defoliants, Freshwater fish, *Sunfishes, Agricultural chemicals, Water pollution sources, Agricultural runoff, Lethal limit, Pesticides, Bioassay, *Toxicity, Identifiers: *Picloram, *Tordon, *Green sunfish,

Lepomis spp.

The effects of two common herbicides, picloram or Tordon (4-amino-3,5,6-trichloropicolinic acid) and 2,4-D (2,4-dichlorophenoxy-acetic acid), and their salts on the green sunfish (Lepomis cyanel-lus) were studied. With 2,4-D, neither the acid nor lus) were studied. With 2,4-D, neither the acid nor commercial salt formulations were toxic at a concentration of 0.0005 M. However, at the same concentration, the butoxy ethanol ester of 2,4-D proved toxic after 60 min of exposure. With picloram, the 99% analytical grade material was nontoxic at 0.0005 M. However, both the 91% technical picloram and the 22% commercial formulation were toxic suppositions the presence of mulation were toxic, suggesting the presence of a toxic impurity in these preparations. Fish were quickly immobilized by 0.0005 M technical picloram but did not die. Recovery time varied as an approximately linear function of treatment time. Upon second, third and fourth exposures the fish recovered in increasingly shorter times. Liver changes were observed even in those fish exposed to 0.0001 M technical grade pictoram. Ester formulations of both herbicides tend to increase toxicity. Both herbicides seemed to present a low potential hazard to fish from normal agricultural or industrial practice. (Svensson-Washington) W72-08065

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MERCURY CONCENTRATIONS IN MUSEUM SPECIMENS OF TUNA AND SWORDFISH, California Univ., Irvine. Dept. of Chemistry. G. E. Miller, P. M. Grant, R. Kishore, F. J. Steinkruger, and F. S. Rowland. Science, Vol. 175, No. 4026, March 10, 1972, p 1121-1122. 1 tab, 3 ref. AEC AT-(04-3)-34.

Descriptors: *Mercury, *Absorption, Water pollution sources, Public health, Water pollution, Path of pollutants, Pollutants, *Neutron activation analysis, Analytical techniques. Identifiers: *Tuna fish, *Swordfish, Pipefish.

The mercury levels of museum specimens of seven tuna caught 62 to 93 years ago, and a swordfish caught 25 years ago were determined by instrumental neutron activation analysis. These levels are in the same range as those found in specimens caught recently. Samples of the original preservative used for the swordfish were available and were analyzed for mercury content. No mercury was detected. A pipefish caught at the same time as the swordfish and its preservative solution were also analyzed. Only 0.17 plus or minus 0.15 mg/l (dry weight basis) of mercury was found in the pipefish. The preservative contained no detectable mercury. (LeGore-Washington) W72-08066

ECOLOGICAL EFFECTS OF PESTICIDES ON NON-TARGET SPECIES, Cornell Univ., Ithaca, N. Y. Dept. of Entomology

Cornell Univ., Ithaca, N. Y. Dept. of Entomology and Limnology. D. Pimentel.

D. Fimentel.

For sale by the Superintendent of Documents, U.
S. Government Printing Office, Washington, D.C.
20402 Price \$2.00. Executive Office of the President, Office of Science and Technology Monograph. June 1971. 220 p. 92 tab, 730 ref, 3 app.

Descriptors: *Water pollution effects, *Pesticides, *Pesticide residues, *Reviews, *Lethal limit, *Agricultural chemicals, *Pesticide drift, *Pesticide toxicity, Water pollution sources, Path of pollutants, Pollutants, Toxicity, Public health, Algicides, Herbicides, Fungicides, Inorganic pesticides, Insecticides, Organic pesticides, Chlorinated hydrocarbon pesticides, Chemcontrol, Food chains, Pesticide kinetics, Toxins.

The available evidence is summarized concerning the impact of pesticides (insecticides, herbicides and fungicides) on individuals, populations and communities of non-target species. For each named pesticide, pertinent information has been presented about its influence on mammals, birds, fishes, amphibians, molluscks, arthropods, an-elids, plants and microorganisms. When information is available, each pesticide's persistence and biological concentration in food chains are also considered. No comments are made concerning the validity of reviewed papers, but an assessment of the total evidence relative to the dangers to the ecology of populations, communities and ecosystems is presented. The review is selective, including only the information considered scientifically valid. (LeGore-Washington) W72-08067

LIMNOLOGICAL FACTORS AFFECTING PESTICIDE RESIDUES IN SURFACE WATERS, Iowa State Water Resources Research Inst., Ames.

For primary bibliographic entry see Field 05B. W72.08068

DISTRIBUTIONAL PATTERNS IN ASSEMBLAGES OF ATTACHED DIATOMS FROM YAQUINA ESTUARY, OREGON, Oregon State Univ., Corvalis. Dept. of Botany; and Oregon State Univ., Corvalis. Dept. of Statistics. For primary bibliographic entry see Field 05B. W72-08141

INFESTATION OF BENTHIC CRUSTACES, FISH EGGS, AND TROPICAL ALGAE, Rhode Island Univ., Kingston. Dept. of Bacteriology and Biophysics. P. W. Johnson, J. McN. Sieburth, A. Sastry, C. R. Arnold, and M. S. Doty. Limnology and Oceanography, Vol. 16, No. 6, p 962-969, November 1971. 1 fig, 3 tab, 17 ref.

Descriptors: *Crustaceans, *Marine bacteria, *Water quality, Benthos, Crabs, Copepods, Marine algae, Shrimp, Fish eggs, Fish, Bacteria, Fish parasites, Antibiotics (Pesticides), Bacteria-cides, Atolls, Cultures, Sphaerotilus, Cladophora. Identifiers: Pleopods, Uropods, Enrichment, Leucothrix mucor, Majuro Atoll, Marchall Island, Polysiphonia lanosa, Chondrus crispus, Cod, Flounder, Crab eggs, Pelagic eggs, Gadus morhua, Grass shrimp, Green crab, Penicillium, Streptomycin, Epiflora, Walleye larvae, Shad, Macroinvertebrates, Cyanophyceae.

Characteristic filaments of the bacterium Leucothrix mucor are often found on appendages and eggs of benthic marine crustaceans and on a wide variety of algae. Planktonic crustacea and fish eggs can become infested in aquaria in the absence of antibiotics. Death of cod, flounder, benthic invertebrates, and crab eggs has been attributed to large populations of L. mucor. Copepods, shrimp, and a variety of crabs can be infected. Although L. mucor is not pathogenic, it may cause death by causing pelagic eggs to sink below the surface and by interfering with the filtering apparatus of crustacean larval forms, e.g., pleopods and uropods. Antibiotics such as penicillis and streptomycin prevent L. mucor development and decrease associated mortality. Examination of 48 marine algae samples from the lagoon at Majuro Atoll in the Marshall Islands showed that 81 percent was infected by the bacteria. Eighteen random samples showed 100 percent infestation upon enrichment. These observations are at variance with previous reports of L. mucor's absence or rarity in warm waters. Sphaerotilus natans is the freshwater coefficient of the organism, displaying the same effects on flora and fauna of the areas infested. (Mackan-Battelle)

SPECIES DIVERSITY OF NET ZOOPLANKTON AND PHYSIOCHEMICAL CONDITIONS IN KEYSTONE RESERVOIR, OKLAHOMA, Wisconsin State Univ., Superior. Dept. of Biology. For primary bibliographic entry see Field 05A. W72-08143

WATER QUALITY CRITERIA DATA BOOK, VOL. 1 - ORGANIC CHEMICAL POLLUTION OF FRESHWATER. Little (Arthur D.) Inc., Cambridge, Mass.

Copy available from GPO Sup Doc EP2.10:18010DPV12/70, \$3.50; microfiche from NTIS as PB-208 987, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1970. 379 p, 16 tab, 577 ref. EPA Program 18010DPV12/70.

Descriptors: *Organic compounds, *Fresh water, *Water pollution sources, *Water quality, *Toxicity, Human pathology, Animal pathology, Public health, Water pollution effects, *Chemicals. Identifiers: *Acute toxicity, *Chronic toxicity, *Carcinogenicity, Mutagenicity, Teratogenicity, Tissue concentrations.

Four hundred ninety six organic chemicals have been reported to be found or are suspected to be in fresh water. Of these, sixty six have identified. As might be expected, evidence which directly relates the presence of organic chemicals in fresh water with human health is generally lacking. Industrial sources were responsible for the largest number and variety of structural types of organic chemical pollutants. Reported agricultural sources of pollutants were all pesticides and domestic sources were all detergents. Animal toxicity consisted mainly of acute toxicity data. Pesticides were shown to be the most acutely toxic organic chemicals in water and only methyl mercuric chloride was found to be more toxic. Although the information on chronic threshold doses was insufficient for meaningful interpretation, the organometallics ranked high in chronic toxicity effects. Of one hundred twenty compounds examined for carcinogenicity in animals, 22.5 percent were positive. Of thirty two compounds examined for teratogenicity in animals, 62.5 percent were positive. Although there is no proven chemical mutagen for man, all showed some effects on genetic material. Factual information upon which quality criteria of water can be rationally based is generally lacking. (See also W72-08158) (EPA abstract)

WATER QUALITY CRITERIA DATA BOOK, VOLUME 2 - INORGANIC CHEMICAL POLLUTION OF FRESHWATER. Little (Arthur D.) Inc., Cambridge, Mass.

Copy available from GPO Sup Doc EP2.10:18010DPV 07/71, \$2.25; microfiche from NTIS as PB-208 988, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, July, 1971. 280 p, 3 fig, 13 tab, 276 ref. EPA Program 18010DPV 07/71.

Descriptors: *Inorganic compounds, *Freshwater, *Water pollution sources, *Water quality, *Toxicity, Human pathology, Animal pathology, Public health, Water pollution effects, *Chemicals. Identifiers: *Acute toxicity, *Chronic toxicity, *Carcinogenicity, Mutagenicity, Teratogenicity, Tissue concentrations.

A survey of the literature dealing with inorganic chemical compounds was conducted to obtain reference data relevant to the establishment of water quality criteria. More than 5,000 publications were reviewed. While nearly 300 inorganic species may exist in freshwater only 87 were identified in the literature. A wide distribution in concentrations in potable and polluted water was found. Data on acute toxicity, carcinogenicity, mutagenicity, and teratogenicity of inorganic chemicals have been tabulated. Because of the design of most of these toxicological determinations, it is difficult to extrapolate from this data to human health. This inability is furthered in that the concentrations of many materials in freshwater are reported in terms of elemental analysis alone without reference to the ionic or complex form of the material. However, toxicity varies with the complex ion and oxidation state. Correlations have been made of minimum lethal oral dose versus maximum concentration reported in freshwater, and of minimum chronic toxic dose versus maximum concentration reported in drinking water. Examples of inorganic species which approach a safety limit have been observed. (See also W72-08157) (EPA abstract) W72-08158

EFFECT OF INDUSTRIAL AND DOMESTIC EF-FLUENTS ON THE WATER QUALITY OF THE COUER D'ALENE RIVER BASIN, For primary bibliographic entry see Field 05B. W72-08163

Group 5C-Effects of Pollution

FALLOUT MN-54 AND ZR-95 IN WATER AND FISHES OF FOUR LAKES IN NORTHERN ITA-

European Atomic Energy Community, Ispra (Ita-

Emiopean Acone Eatery Community, apra (tally), Protection Service.

M. C. de Bortoli, P. Gaglione, and O. Ravera.

Giornale di Fisica Sanitaria e Protezione Contro
Le Radiazioni, Vol 13, No 1, p 72-77, Jan-Mar
1969, 2 fig. 3 tab., 29 ref. From 14th National Conf. of the Italian Assoc. for Health Physics and Protection from Radiation, Formia, Italy, May 29,

Descriptors: *Fallout, *Magnesium, *Lakes, *Radioisotopes, Water pollution, Water pollution sources, Aquatic life, Aquatic animals, Fish diets, Public health, Food chains.

Identifiers: Concentration, Comparison, Species,

The comparison between the 54Mn and 95Zr-95Nb concentration in the fishes collected from the four lakes shows a very different behaviour for the two radionuclides. For example, the highest concentra-tion of 95Zr-95Nb and the lowest of 54Mn was found in the fishes of Lake Varese. In addition, the 54Mn concentration was about the same for the three fish species, whereas the 95Zr-95Nb concentration showed a very large difference among the species. For example, the concentration of Perca was about 25% that of Scardinius. The dif-ferent behaviour of the two nuclides may be due to many reasons, such as the different geochemistry and physico-chemical form and the different role played in the fish metabolism and in the food-web. (Houser-ORNL) W72-08236

UPTAKE AND EXCRETION OF RADIOCOBALT BY A FRESHWATER MOL-LUSC, (UNIO MANCUS VAR. ELONGATULUS), European Atomic Energy Community, Ispra (Ita-

ly). Biology Div. O. RaVera, M. Merlini, and S. Musso.

Giornale Di Fisica Sanitaria e Protezione Contro Le Radiazoni, Vol 3, No 4, October-December 1969, p 301-305. English summary. From 14th National Conf of the Italian Assoc for Health Physics and Protection from Radiation, Formia, Italy, May

Descriptors: *Radioisotopes, *Cobalt, *Radioecology, *Water pollution, *Water pollution effects, *Water pollution sources, *Aquatic life, Waste water disposal, Effluents, Absorption, Crustaceans, *Mollusks.

Identifiers: Concentration, Transfer, Reconcentration, Excretion.

Radioactive cobalt, primarily 60Co is one of the most important isotopes discharged by the Ispra Center into the Creek Novellino, an affluent of Lake Maggiore (Lago Maggiore). Since it is well known that bivalves (Lamellibranchs) concentrate transition elements to a great extent, the bivalve Unio mancus of Lago Maggiore was chosen for the study of radiocobalt. It is a Lamellibranch with a wide distribution and a high population density in the lake. Studies or radiocobalt uptake and loss were undertaken both in the laboratory and in nature (Creek Novellino). It appears that this mollusc is able to concentrate measurable amounts of radiocobalt even when the activity in the environment is extremely low. The factors involved in these processes are presented and discussed. (Houser-ORNL) W72-08237

CONSEQUENCES OF EFFLUENT RELEASE: ESTIMATES OF DOSE TO NORTHERN HEMI-SPHERE POPULATION GROUPS FROM KRYP-TON-85 EMITTED BY A SINGLE NUCLEAR FUEL-REPROCESSING PLANT, California Univ., Livermore Lawrence Radiation

Lab. B. Knox, and K. R. Peterson.

Nuclear Safety, Vol 13, No 2, p 130-135, March-April 1972. 1 fig, 5 tab, 6 ref.

Descriptors: *Nuclear power plants, *Nuclear energy, *Fuels, *Uranium, *Effluents, *Krypton radioisotopes, *Population, Animal populations, Aquatic populations, Environmental effects, Air circulation, Climatology, Meteorology, velocity, Asia, Fallout.

Identifiers: Dose, Population exposure, Dose calculation, Atmospheric, Global circulation

Estimates of the population dose (man-rems) at close-in to hemispheric distances from a single nuclear fuel-reprocessing plant (FRP) have been calculated. The highest doses occur in close proximity to the plant or where the population is large. Asia experiences the largest population dose, principally because of its dense population; natural radioactivity yields a significantly higher exposure. The population within 1000 km of the plant has the next highest population dose, because of proximity. The smallest doses occur in polar and equatorial latitudes. The procedure outlined is applicable to all existing or planned FRPs, provided that effluent-release information is available. Hence it is possible to ascertain the population dose from all FRPs and to compare the results with internationally accepted standards. In this application, however, a multicompartment model would probably yield improved estimates. It is expected that the aquatic population groups would receive doses equal to those of the land groups. (Houser-ORNL) W72-08241

THE EFFECTS OF DIATOMS ON THE LARVICIDAL ACTIVITY OF DURSBAN, NOVEMBER 1969 - MARCH 1970, Army Environmental Hygiene Agency, Edgewood

Arsenal, Md.

Arsena, Mu.

D. R. Roberts, and T. A. Miller.

Available from the National Technical Information Service as AD-724 647, \$3.00 in paper copy, \$0.95 in microfiche. Entomological Special Study No 31-002-71, 1970. 14 p, 2 fig, 3 tab, 4 ref, 1 ap-

Descriptors: *Larvicides, *Diatoms, *Chemcontrol, *Pesticides, Insect control, Larvae, Mosquitoes, *Insecticides, Ultraviolet radiation, Mosquitoes, "Insecticutes, utraviolet radiation, Hydrogen ion concentration, Water pollution ef-fects, Water pollution control. Identifiers: "Pursban, Nitzchia spp., Culex pipiens, Pesticide degradation, O-0-diethyl O- (3-5-6-trichloro-2-pyridyl) phosphorothioate.

A colony of field collected diatoms was established in the laboratory and used to study interactions between the diatoms, the 3rd-4th instar larvae of Culex pipiens quinquefasciatus, and Dursban (O,O-diethyl O- (3,5,6-trichloro-2-pyridyl) phosphorothioate). Comparative observations of diatom cell density and the pH of the culture medium indicated that pH, in itself, could be used as a measure of increasing cell density and the metabolic state of the diatom culture. Dursban at a rate of 0.4 mg/l had an adverse effect on the degradation rate of Dursban. Diatoms appeared to accumulate definite quantities of Dursban, but the amounts were minute relative to the total amount of insecticide present in the culture medium. Diatoms had no significant effect on the larvicidal activity of Dursban. Most of the loss of Dursban from the culture medium, and the corresponding decrease in larvicidal activity, was attributed to ultraviolet degradation of the insecticide. (Svensson-Washington) W72-08242

EFFECTIVENESS OF 9.9 PERCENT DURSBAN IN POLYETHYLENE APPLIED AS A PRE-SEASON LARVICIDE, FEBRUARY - APRIL

Army Environmental Hygiene Agency, Edgewood Arsenal, Md.

For primary bibliographic entry see Field 05G. W72-08243

FLOATING LABORATORY FOR STUDY OF AQUATIC ORGANISMS AND THEIR EN-VIRONMENT, National Marine Fisheries Service, Seattle, Wash.

For primary bibliographic entry see Field 09C.

ALASKA'S FISHERY RESOURCES-- THE SOCKEYE SALMON, National Marine Fisheries Service, Seattle, Wash.

W I. Hartman

Available from the National Technical Information Service as COM-71-00596, \$3.00 in paper copy, \$0.95 in microfiche. Fishery Leaflet 636, March 1971. 8 p, 8 fig, 2 tab, 8 ref.

Descriptors: *Sockeye salmon, *Fish management, *Commercial fishery, *Fish conservation, Alaska, Salmon, Fisheries, Fish migration, Fishing, Marine fisheries, Lake fisheries, Stream fisheries, Anadromous fish, Juvenille fish, Fry, Salmorida, Smalk, Fish caractering, Smaller, Fish caractering, Fish caractering, Smaller, Fish caractering, Smaller, Fish caractering, Fish c Salmonids, Smolt, Fish reproduction, Spawning, Life cycles.

Identifiers: *Oncorhynchus nerka, *Alaskan fishery resources, Fishery resources, Baseline stu-

Sockeye salmon, Oncorhynchus nerka, are produced in river-lake systems of Canada, Alaska and the Soviet Union. Alaska production has averaged \$32 million to the wholesaler annually since 1945; the value was \$72 million in 1965. Female sockeye salmon carry about 3,500 eggs and spawn in late fall in lake inlets and outlets and in the lakes themselves. The following spring, inch-long fry emerge and migrate at night to the lakes. After spending 1-4 years in the nursery lakes, the fish migrate in schools to feeding grounds in the Pacific Ocean. After 1, 2 or 3 years at sea, the maturing sockeye salmon return through the coastal waters to the freshwater spawning grounds. Sockeye salmon when grown weigh 6-9 pounds and are an average 24 in. long. They are captured by a Japanese high seas gill net fishery, an American inshore gill net fishery, and the Alaskan native subsistence fishery in the rivers and lakes. The State of Alaska manages the inshore fishery. (Svensson-Washington)

THE USE OF WATER-QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THER-MAL EFFECTS PROBLEM, RAND Corp., Santa Monica, Calif.

For primary bibliographic entry see Field 05B. W72-08257

SIMULATION OF THE ANNUAL ECOLOGI-CAL CYCLE OF BENTHIC MARINE PLANTS--EELGRASS IN IZEMBEK LAGOON, ALASKA, Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-08263

LIMNOLOGICAL INVESTIGATIONS TEXAS IMPOUNDMENTS FOR WATER QUALITY MANAGEMENT PURPOSES, Texas Univ., Austin. Center for Research in Water WATER Resources For primary bibliographic entry see Field 05G. W72-08307

WATER QUALITY PROTECTION FOR IN-LAND LAKES IN WISCONSIN: A COM-PREHENSIVE APPROACH TO WATER POLLU-

Wisconsin Univ., Madison. School of Natural Resources. For primary bibliographic entry see Field 05G.

W72-08349

KINETICS OF ALGAL GROWTH IN AUSTERE

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MEDIA, Albany County Sewer District, N.Y. G. C. McDonald, R. D. Spear, R. J. Lavin, and N.

In: Properties and Products of Algae, Plenum Press 1970, p 97-105, 5 fig, 2 tab, 5 ref.

Descriptors: *Algae, *Growth rates, *Nutrients, Cultures, Inhibition, Oligotrophy, Phosphorus, Nitrogen, *Eutrophication, Laboratory tests, Water quality control, *Kinetics, *Chlorophyta, Algal control, *New York.
Identifiers: *Selenastrum capricornutum, *Algal growth, *Lake George (NY).

Selenastrum capricornutum is a uni-cellular green alga which is easy to culture in the laboratory and has been documented as having produced nuisance blooms in European lakes. S. capricornutum was cultured in laboratory using the Basic ASM medium of the provisional algal assay procedure (PAAP) and a 10 to 1 dilution of Gorham's medium with an increase in sodium carbonate concentration to 50 mg/l as a pH control aid. Dilution water for both media preparations aid. Dilution water for both media preparations was glass distilled water and/or 0.45 micron mem-brane filtered Lake George water (an oligotrophic soft water). After growth rates had been established in the various media, distilled water, and Lake George water combinations, the concentrations of nitrogen and phosphorus were reduced to one half and one quarter of the full amount and new growth rate levels at each concentration were accrtained. Results demonstrated an inhibitory effect, as evidenced by reduced growth rates, when Lake George water was used as dilution water in either medium. The extent and causative factors for such inhibition became the focal point for further investigation. Results also showed that the nitrogen concentration in modified tenth Gorham's medium may be reduced to one-half the posited level without any significant growth rate changes for Selenastrum capricornutum. (Lowry-Texas) W72-08376

STREAM POLLUTION FROM FEEDLOT RU-

NOFF, Kansas State Dept. of Health, Topeka. Environ-

mental Health Services.
For primary bibliographic entry see Field 05B.
W72-08390

CHARACTERISTICS AND EFFECTS OF CAT-TLE FEEDLOT RUNOFF,
Robert S. Kerr Water Research Center, Ada,

For primary bibliographic entry see Field 05B. W72-08401

EFFECTS OF AGRICULTURAL DISCHARGES INTO FRESH WATER LAKES,
Orange County Pollution Control Dept., Orlando,

For primary bibliographic entry see Field 05B.

POLYCHLORINATED BIPHENYLS: TOXICITY

TO CERTAIN PHYTOPLANKTERS, State Univ. of New York, Stony Brook. Marine Science Research Center.

N. S. Fischer, J. L. Mosser, T. C. Teng, and C. F.

Wurster. Science, Vol. 175, p 191-192, 14 January 1972. 1 fig, 18 ref.

Descriptors: *Polychlorinated biphenyls, *Chlornated hydrocarbon pesticides, *Pesticide toxicity, *DDT, Pesticides, Phytoplankton, Diatoms, Algae, Marine algae, Aquatic algae, Euglena, Chlamydomonas. Identifiers: Freshwater algae, Thalasiosira spp., Skeletonema spp., Dunaliella spp.

The growth rates of two species of marine diatoms were reduced by polychlorinated biphenyls (PCB's), widespread pollutants of the marine environment, at concentrations as low as 10-25 micrograms/1. In contrast, a marine green alga and two species of freshwater alga were not inhibited at these or higher concentrations. The sensitivity of these species to PCB's paralleled their sensitivity to DDT (1,1,1-trichloro-2,2-bis (p-chlorophenyl)ethane). (Svensson-Washington) W72-08436

MERCURY LEVELS IN MUSCLE TISSUES OF PRESERVED MUSEUM FISH, Michigan Dept. of Natural Resources, Lansing. R. J. Evans, J. D. Bails, and F. M. D'Itri. Research Report (1971), 28 p, 3 fig, 3 tab, 17 ref. OWRR A-051-MICH (1).

Descriptors: *Mercury, *Lake Erie, Metals, Absorption, Water pollution effects, Public health, Great Lakes, Lampreys, Water quality, Fish physiology.
Identifiers: *Lake St. Clair, Muskellunge.

Flameless atomic absorption spectrophotometry was used to establish the total mercury levels in 57 preserved fish specimens of various species col-lected in the Lake St. Clair-Western Lake Erie region of the Great Lakes between the years of 1920-1965. Only five fish were found to contain mercury levels above 0.5 mg/1: three large muskellunge col-lected in Lake St. Clair in 1939 (2.38, 1.57 and 1.58 mg/1) and two adult sea lampreys collected in the Clinton River tributary to Lake St. Clair in 1938 (0.90 and 1.29 mg/1). A trend was established relating the mercury content of selected categories of fishes with the year and location of collection for the fish specimens. The 1970-71 mercury levels in fish from the two study areas were found to average more than those preserved museum specimens in the same categories taken from the same area. (LeGore-Washington) W72-08437

TROUBLED WATERS, LAKE ERIE 1971. Social Technology Systems, Inc., Newton, Mass.

Available from the National Technical Informa-tion Service as PB-201 449, \$3.00 in paper copy, \$0.95 in microfiche. Prepared for Lake Erie Con-gress, Erie, Pa., July 12-14, 1971. 121 p, 3 tab, 31

Descriptors: *Lake Erie, *Great Lakes, *Reviews, *Mercury, *Pesticides, *Eutrophication, *Water pollution control, *Thermal pollution, Lakes, Water pollution effects, Water pollution sources, Water quality, Abatement, Regulation. Identifiers: Pollution abatement.

The intent of this publication is to present an anthology on Lake Erie's problems and prospects presented in clear English. Topics are not covered presented in clear English. Topics are not covered in depth, but a broad overview of the subjects of pollution and pollution abatement are provided. The first section of the work reproduces conversations between experts in various fields, who discussed water movements in Lake Erie, life and death in Lake Erie, and human mechanics. The second section is composed of topical abstracts in several areas, including mercury and pesticide contamination, eutrophication, bacteria, thermal pollution, physical characteristics, pollution con-trol, and institutional, economic and political fac-tors affecting Lake Erie pollution abatement. These abstracts are not definitive statements, but they very briefly recapitulate the state of the art in each field as it appears in the literature. (LeGore-Washington) W72-08438

DISTRIBUTION OF AQUATIC MACRO-FAUNA IN A MARSH ON WEST GALVESTON BAY, TEXAS AND POSSIBLE EFFECTS THEREON

Effects of Pollution—Group 5C

RESULTING FROM IMPOUNDMENTS FOR SHRIMP CULTURE,
Texas A and M Univ., College Station, Agricultural Extension Service.
J. C. Parker, H. W. Holcomb, Jr., W. G.
Klussmann, and J. C. McNeill, IV.
Texas A AND M University, Sea Grant Publication No. TAMU-SG-71-208, March 1971. 32 p, 4 fig, 3 tab, 18 ref. GH-101.

Descriptors: *Aquiculture, *Biological communi-ties, *Marsh management, Shellfish farming, Shrimp, Habitats, Marshes, Aquatic biology, Planning, Management, Texas. Identifiers: *Galveston Bay (Texas), Marsh ecolo-

A survey was conducted to identify the macrofauna of a marsh adjacent to West Galveston Bay, Texas. The factors affecting their distribution were studied for evaluation of changes which might result from large areas of marsh being impounded for shrimp culture. Results indicate that construction of large scale impoundments for shrimp culture, at the expense of removing flooded grasslands, would alter the physical features of the marsh and reduce the habitats suitable for year-round survival of the stable macrofauna. In addition, competitor and predator control in In addition, competitor and predator control in these ponds would require the removal of all aquatic macrofauna other than shrimp. The impact of these changes on the total marsh ecosystem is not known but should be considered and studied in detail before ponds are constructed. Conceivably, marsh areas could be managed so as to insure a reasonable amount of habitat for the stable macrofauna while allowing ample lands for shrimp culture. (LeGore-Washington) W72-08439

TOXICITY OF 2,4-D AND PICLORAM TO FRESH WATER ALGAE, Purdue Univ., Lafayette, Ind.
J. H. Elder, C. A. Lembi, and D. J. Morre.
Purdue Univ. and Indiana Highway Comm. Joint Publication No. 23, 1970. 10 p, 4 tab, 7 ref.

Descriptors: *Pesticide toxicity, *Water pollution effects, Bioassay, Pesticides, Herbicides, 2-4-D, Plant growth regulators, Algae, Aquatic algae, Chlorella.

Identifiers: Tordon, Freshwater algae, Picloram, Pediastrum, 4-amino-3,5,6-trichloropicolinic acid, 2,4-dichlorophenoxyacetic acid.

The solubility of 2,4-D acid in water is approximately 0.0025 M, that of picloram 0.0018 M. Therefore, the highest concentration tested was 0.001 M. At this concentration, no effect was observed on most of the organisms with 2,4-D and none of the organisms with picloram. With technical picloram, motile species were found to lose motility at 0.001 M and 0.005 M, but not at 0.0001 M. The toxic principle is an impurity in the technical picloram tentatively identified as 2 (3,4,5,6-terrachloro-2-pyridyl) guanidine. The results show cal pictoram tentauvery identified as 2,3,4,5,6 tetrachloro-2-pyridyl) guanidine. The results show that the potential hazard of 2,4-D or pictoram to both freshwater and marine algae from terrestrial runoff water or from direct or indirect contamina-tion is nil. Certain 2,4-D derivatives (particularly esters) may be substantially more toxic than the parent acid. In this regard, it will be necessary to examine a number of 2,4-D derivatives in different examine a number of 2,4-D derivatives in different formulations to seek those which will result in minimum damage to algae, fish and other aquatic organisms. There is no evidence for biological magnification of either 2,4-D or picloram in algae. (Svensson-Washington) W72-08440

BLUE CRAB STUDY IN CHESAPEAKE BAY,

MARYLAND, Maryland Fish and Wildlife Administration, An-

napolis.

R. L. Lippson.

Available from the National Technical Information Service as COM-71-01134, \$3.00 in paper

Group 5C-Effects of Pollution

copy, \$0.95 in microfiche. Univ. of Maryland, Natural Resources Inst., Ref. No. 70-46, 1970. 17 p, 4 fig. NOAA PL 88-309.

Descriptors: *Crabs, *Commercial shellfish, *Chesapeake Bay, *Maryland, Crustaceans, Shellfish, Aquatic populations, Animal growth, Ecological distribution, Growth rates, Food abundance, Forecasting.
Identifiers: *Blue crab, Callinectes spp., Seafood.

Juvenile blue crabs were sampled in Chesapeake Bay during 1969 to monitor movements, abundance, and growth rates. Push-net sampling was conducted at 12 stations. Commercial sized crabs were sampled by data sheets directed to packers and individual crabbers. The great abundance of blue crabs in Chesapeake Bay during 1969 may have caused a depletion of available food, with the result that some crabs were in a semi-starved condition. Crowding may have had in inhibiting effect upon feeding. Predictions based upon this study, which were released to the com-munications media and seafood industry, were substantially correct and were released early enough that seafood processors, commercial fisherman, sports fishermen and tourists could take advantage of the record number of blue crabs present in Chesapeake Bay during 1969. (Svensson, Washington) W72-08441

A SURVEY OF THE OYSTER AND OYSTER SHELL RESOURCES OF ALABAMA, Alabama Dept. of Conservation, Dauphin Island.

Seafoods Div

E. B. May.

E. B. May. Available from the National Technical Informa-tion Service as COM-72 10012, \$3.00 in paper copy, \$0.95 in microfiche. Alabama Marine Resources Bulletin No. 4, Feb. 1971. 63 p. 12 fig, 13 tab, 52 ref, 2 app. NOAA 7301000/PL 88-309.

Descriptors: *Oysters, *Resources, *Alabama, *Commercial shellfish, Pesticides, Water pollution effects, Fisheries, Shellfish, Marketing, Mapping. Identifiers: *Fishing grounds, *Economic surveys, *Oyster reefs, Animal ecology, Seafood, Pollution, Position, Biological survey, Shell dredging.

The public oyster reefs and buried shell deposits in Alabama were mapped and inventoried. Second order survey was used to establish triangulation stations for mapping. There are 3,064 acres of natural oyster reefs in Alabama. The average oyster harvest from 1948 through 1968 was 1,220,000 pounds, valued at \$415,000. An average of 655 handtong fishermen earned \$638/yr from 1948 through 1968. The fishery is valued at \$1,660,000 annually, which is about four times the dockside value. Average annual production is 398 pounds of meats/acre, with a present value to fishermen of \$200/acre. If the economics of the fishery are considered, each acre contributes \$542/yr to the area economy. Pollution closure of oyster reefs results in an average loss to the fishermen of \$1,671/day. About 2,000 acres of private oyster bottoms produce 12% of Alabama's landings and are valued at \$147/acre/yr. SCUBA and random square yard quadrats were used to sample oyster reefs. The distribution of samples was homogenous. (Svensson-Washington) W72-08442

EVALUATION OF TOXICITY OF SELECTED TNT WASTES ON FISH, PHASE I-ACUTE TOX-ICITY OF ALPHA-TNT TO BLUEGILLS, 1
JANUARY 1970-31 OCTOBER 1970,
Army Environmental Hygiene Agency, Edgewood

Arsenal, Md. G. L. Pederson.

Available from the National Technical Information Service as AD-725 572, \$3.00 in paper copy, \$0.95 in microfiche. Sanitary Engineering Special Study No. 24-007-70/71. (1970). 35 p, 11 fig, 6 tab, 10 ref, 3 append. Descriptors: *Water pollution effects, *Lethal limit, *Sunfishes, *Nitrates, *Nitrites, *Toxicity, Bioassay, Water pollution sources, Water quality, Aquatic animals, Fish, Freshwater fish, Inorganic compounds, Pollutants.
Identifiers: *TNT, Trinitrotoluene.

The acute toxicity of alpha-TNT (2,4,6 trinitrot-luene) to bluegills was determined relative to variations in water temperature or in water hard-ness. Ninety-six hour LC-50 values ranged from ness. Minety-six nour L2-30 values ranged from 2,3 to 2.8 mg/l of alpha-TNT. Water temperature significantly affected the toxicity of alpha-TNT, i.e. lower concentrations were required to ellicit toxicity at 10C than at 25C. Water hardness had no apparent effect. (LeGore-Washington) W72-08449.

EVALUATION OF POLYMER FORMULA-TIONS OF DURSBAN AS MOSQUITO LARVI-CIDES, APRIL-OCTOBER 1970, Army Environmental Hygiene Agency, Edgewood

Arsenal, Md. T. A. Miller, and L. L. Nelson.

1. A. Miller, and L. L. Neison. Available from the National Technical Informa-tion Service as AD-729 344, \$3.00 in paper copy, \$0.95 in microfiche. Entomological Special Study No. 31-014-71. (1971). 27 p, 5 fig, 4 ref, 8 append.

Descriptors: *Chem control, *Mosquitoes, ticides, *Application methods, Bioassay, Diptera, Insects, Public health, Larvae, Aquatic insects, Water pollution sources, Water pollution effects.

Identifiers: *Dursban.

The larvicidal effectiveness of three polymer formulations of Dursban (0,0-diethyl 0- (3,5,6-trichloro-2-pyridyl)phosphorothioate) was compared with that of Dursban water emulsion formulation. The three polymer formulations were: 9.9% Dursban in polyethylene; 10% Dursban in polyvinyl chloride; and 11.5% Dursban in chlorinated nyl chioride; and 11.3% Dursban in chiorinates polyethylene. The effectiveness of the various formulations was monitored on a weekly basis by gas chromatographic residue analysis and by bioassay with 4th instar larvae of Culex pipiens quinquefasciatus. Although the polymer formulations provided effective long-term control of mosquito larvae, they are not presently recommended for use. (LeGore-Washington) W72-08444

THE RESPONSE OF FISH POPULATIONS IN THE WABASH RIVER TO HEATED EF-FLUENTS

DePauw Univ., Greencastle, Ind. Dept. of Zoolo-

J. R. Gammon.

Presented at 3rd National Symposium on Radioecology, May 11, 1971, Oak Ridge, Tennes-see. 38 p, 6 fig, 3 tab, 29 ref. OWRR B-031-IND

Descriptors: *Water pollution effects, *Thermal pollution, *Fish conservation, Water pollution sources, Heated water, Path of pollutants, Water temperature, Electric power, Fish populations, Fish behavior, Effluents, *Indiana. Identifiers: *Wabash River.

Eight fossil-fueled electric generating stations with a combined capacity of 2,348 megawatts line the banks of the Wabash River, with an additional 500 Mw expansion planned for 1972. Most of the present research effort was expended at two sites, one thermally modified and one unmodified, on the middle Wabash River, with short-term collections at several other points. Relative indices of abundance for various species of fish were obtained and water temperatures recorded. Direct mortality induced by temperature was never ob-served during the study, undoubtedly because of the ability of fish to detect and avoid waters which exceed optimum temperatures. There were some consistent differences in composition of the fish populations at the two sites, seemingly attributa-ble, at least in part, to the presence of a heated effluent from a power station. Some species were virtually eliminated from the thermally elevated zones during the summer, while others were attracted to the heated water. Most species absent in the summer returned in the fall when temperatures moderated. Specific information on several species is presented. (Svensson-Washington) W72-08446

SURVEY OF MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION, State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05B. W72-08447

NEW YORK DEPARTMENT OF ENVIRON-MENTAL CONSERVATION-FOREST SERVICE COOPERATIVE GYPSY MOTH SUPPRESSION PROJECT 1971 (FINAL ENVIRONMENTAL IM-PACT STATEMENT).
Forest Service, (USDA) Washington, D.C.

Available from the National Technical Informa-tion Service as PB-198 992F, \$3.00 in paper copy, \$0.95 in microfiche. May 12, 1971. 53 p, 82 ref, 1

Descriptors: *Chemcontrol, *Carbamate pesticides, *Pesticide toxicity, *Pesticide drift, Pesticides, Insecticides, Forest management, Conservation, Insect control, Pest control, Viruses, Water pollution effects, Water pollution sources, *New York.
Identifiers: *Sevin, *Gypsy moth, Forest resources, Defoliation, Gardona, Dylox, Disparlure, Genetic control, Bacillus thuringiensis, *Environmental Impact Statements.

In 1970 an estimated 5.5 million acres of forest land in New York were infested by the gypsy moth. Of this total, 429,000 acres were defoliated in 1970. The New York Dept. of Environmental Conservation proposed to treat 290,000 acres of state and private woodlands in 1971. The purpose state and private woodlands in 1971. The purpose was to protect forest resources from imminent damage by the gypsy moth. The beneficial effects of the proposed spraying would be protection of forest resources that people value for air purification, temperature modification, recreation, esthetics, shade, wildlife habitats, watershed protection, and timber production. The adverse effects of spraying are also considered and evaluated. Carbaryl (Sevin) is a carbamate insecticide and is effective assists a large number of insects and is effective against a large number of insects, including the target pest. Carbaryl is toxic to bees; it is a suspected teratogen; and it is toxic to shrimps, crabs, molluscs, and aquatic insects. (LeGore-Washington)
W72-08448

SAN MARCOS NATIONAL FISH HATCHERY, HAYS COUNTY TEXAS (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Bureau of Sport Fisheries and Wildlife, Washing-ton, D.C.

For primary bibliographic entry see Field 08I.

THE CELL WALL OF MARINE AUTOTROPHIC BACTERIA, Woods Hole Oceanographic Institution, Mass.

C. C. Remsen.

Available from the National Technical Informa-tion Service as AD-725 837, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report, Reference No. 71-43. 1971. 19 p, 10 fig, 2 tab, 41 ref, 1 app. N00014-69-C-0184 NR 137-806.

Descriptors: *Cytological studies, *Marine bacteria, *Bacteria, Microbiology, Microorganisms, Aquatic bacteria, Methane bacteria, Water pollution effects, Nitrogen fixing bacteria. Identifiers: *Ultrastructure, *Cell envelope, *Cell wall, Bacterial structure, *Autotrophic bacteria.

A study was made of the ultrastructure and com-position of the cell envelope of different marine autotrophic bacteria. While emphasis was placed on the marine nitrifying bacteria, numerous strains of photosynthetic and methane oxidizing bacteria were also examined. These studies indicate that were also examined. These studies indicate that there are basic arrangements for macromolecular subunits on the cell envelope of marine au-totrophic bacteria which seem to transcend spe-cies and physiological differences. Similarity in ul-trastructure appears to be related to common ecological patterns. (LeGore-Washington) W72-08450

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BACTERIOSTASIS OF ESCHERICHIA COLI BY THE HERBICIDE PARAQUAT, Edgewood Arsenal, Md. C. L. Davison, and B. Papirmeister. Available from the National Technical Informa-tion Service as AD-726 518, \$3.00 in paper copy, \$0.95 in microfiche. Proceedings of the Society for Experimental Biology and Medicine, Vol. 136, No. 2, p 359-364, February 1971. 3 fig, 1 tab, 14 ref. In: Edgewood Arsenal Special Publication EASP 100-106.

Descriptors: *Paraquat, *Herbicides, *Bacteria, *Coliforms, *Bactericides, *Inhibition, Organic pesticides, Pesticides, Sulfur compounds, Water pollution effects Lethal limit, *E. coli. Identifiers: Bacterial physiology, Bacteriostats.

The effects of the herbicide paraquat, 1.1' dimethyl-4,4'-bipyridilium dichloride (Gramoxone W and Weedol) on Escherichia coli B_Ir and E. coli Bs-1 were studied. These bacterial strains are, respectively, radiation resistant and radiation sensitive derivatives of E. coli B. It was found that paraquat is powerfully bacteriostatic against E. coli. In the range of 0.00001 to 0.001 M, paraquat showed similar dose-dependent inhibitory effects on growth rate, synthesis of DNA, RNA, messenger RNA, protein, and glucose utilization. At these concentrations, no significant effect on the bacterial membrane was observed as measured by the release of intracellular phosphate pools. However, approximately 90% of the exposed bacteria, both the radiation resistant and the radiation sensitive strain, and T sub 1 bacteriophage were killed at 0.01 M. A limited study on the HeLa cell indicated that these mammalian cells were also more sensitive to the latter concentration. (LeGore-Washington) Washington) W72-08451

THE FATE AND EFFECTS OF PESTICIDES IN AQUATIC ENVIRONMENTS, Purdue Univ., Lafayette, Ind. Dept. of Forestry and Conservation.

J. Hamelink.

(1971). 17 p, 3 fig, 34 ref. OWRR A-017-IND (2).

Descriptors: *Pesticide kinetics, *Path of pollu-tants, *Model studies, Absorption, Adsorption, Pesticide drift, Water pollution effects, Theoreti-cal analysis, Water pollution, Water quality, Pollu-tants, Pesticide residues.

Pesticide kinetics within a lake are described by viewing the lake as a huge separatory funnel, with water representing one liquid phase, fish and invertebrates as other liquid phases, and algae and sediments are considered adsorbants, invertebrates as extractors, and fish as multi-phase exchange systems. It is argued that bioassays are becoming inadequate to provide information required for further progress, and that models based upon known physical laws possess the potential for elucidating processes occurring in our ecosystem. (LeGore-Washington)

THE FATE OF NITROGEN IN AQUATIC ECOSYSTEMS, Wisconsin Univ., Madison. Water Resources

Dennis R. Keeney.

Available from the National Technical Information Service as PB-209 217, \$3.00 paper copy.

\$0.95 in microfiche. Wisconsin Water Resources Center, Madison. Eutrophication Information Program, Literature Review No 3, 1972. 59 p. 4 fig, 13 tab, 198 ref. OWRR W-117 (No 1614) (4).

Descriptors: *Nitrogen, *Aquatic environment, Productivity, Sediments, Nitrification, Oxidation-reduction potential, Denitrification, Nitrogen fixation, Nitrogen cycle, Ammonia, Nitrates, Model studies, Dissolved oxygen, Carbon, Distribution, Phosphorus, Eutrophication, Algae, Aquatic weeds, Phytoplankton, Oligotrophy, Hardness (Water), Soils, Amino acids, Dredging, Sulfur, Organic matter, Hydrogen ion concentration, Bacteria, Fungi, Runoff, Water pollution sources, Precipitation (Atmospheric), Groundwater, Streams, Seepage, Drainage, Marshes, Diversion, Waste water treatment, Ion exchange. Identifiers: Lake Mendota (Wis), Bantam Lake (Conn), Trout Lake (Wis), Sediment compaction.

(Conn), Trout Lake (Wis), Sediment compaction.

This review of 198 papers considers the many aspects of nitrogen in aquatic ecosystems. Evidence indicates that algae can use organic and inorganic forms of nitrogen and that ammonium is used preferentially by some species. Because of the many transformations involved, the concentrations of various nitrogen species in lake waters vary widely and are the net result of numerous environmental factors influencing rate of nitrogen immobilization, mineralization, nitrification, and denitrification. The large potential source of nitrogen to lakes from sodiments is illustrated. Nitrogen requirements for algal growth must be met from sources other than just the nitrogen in water. The oxidation-reduction system in lakes is discussed extensively. The relative roles of various biological entities (bacteria, fauna, and flora) responsible for nitrogen assimilation and release will vary with the system and with changes in morphological, physical and chemical variables within a given system. Nitrification, denitrification, and nitrogen fixation with the organisms related to them are detailed. (Jones-Wisconsin) W72-08459

ZINC AND COBALT BIOCONCENTRATION AND TOXICITY IN SELECTED ALGAL SPECIES,

Oklahoma Univ., Oklahoma City. Dept. of Environmental Health. R. D. Coelman, R. L. Coleman, and E. L. Rice. Botanical Gazette, Vol 132, No 2, p 102-109, 1971.

Inds. Identifiers: *Algae, Chlorella vulgaris, *Cobalt, Euglena viridis, Pediastrum tetras, *Toxicity, *Zinc, Food chains, *Biocontrol.

The investigation was concerned with toxicity and bioconcentration of Zn and Co in 3 spp. of algae as reflected by growth inhibition, algal accumulation of metal, and percentage uptake. Although there was generally an overall growth decrease from lower to higher metal concentrations (with the exception of the 2 x Zn concentration), increased uptake and concentration of metals occurred in all 3 algal spp. Therefore, the lower cellular weights resulting from high metal concentrations were more effective in accumulating Zn and Co. Chlorella vulgaris had a higher percentage uptake of Zn but a lower percentage uptake of Co than did Euglena viridis and Pediastrum tetras. Chlorella vulgaris thrived in surprisingly high concentrations of Zn. Euglena viridis concentrated the greatest amount of Zn, while both P. tetras and E. viridis had a higher affinity for Co than did C. vulgaris. Concentration of metal to an extreme degree was had a higher affinity for Co than did C. vulgaris. Concentration of metal to an extreme degree was evident in all species studied. The 3 spp., therefore, could accumulate trace metals to an extent in all species studied. The 3 spp., therefore, could accumulate trace metals to an extent that might make them toxic in the food chain. Moreover, all test species could be effective as biological filters to help remove Zn and Co from polluted water. Copyright 1972, Biological Abstracts, Inc.—Copyright 1972, Biological Abstracts, Inc.—W72-08469

LABORATORY STUDIES ON TOLERANCE OF AQUATIC INSECTS TO HEATED WATERS, Utah Univ., Sait Lake City, Dept. of Zoology. Arden R. Gaufin, and Stephen Hern. J Kans Entomol Soc. 44 (2): 240-245. 1971. Identifiers: Amphipoda, Aquatic, Atherix variegata, Cinygmula par, Diptera, Ephemeroptera, Heated, Insects, Laboratory, Plecoptera, Tolerance, Trichoptera.

The mature larvae of 15 spp. of aquatic insects (Diptera, Ephemeroptera, Plecoptera, and Trichoptera) and the scud (Amphipoda) were tested to determine their relative sensitivity to tested to determine their relative sensitivity to heated waters under laboratory conditions. The temperature at which 50% died after 96 hr. was recorded as the lethal temperature. This ranged from 11.7 C for the torrential stream mayfly, Cinygmula par Eaton, to 32.6 C for the snipefly Atherix variegata Walker.—Copyright 1972, Biological Abstracts, Inc. W72-08473

ON THE MEASUREMENT OF PRIMARY PRODUCTION AND BIOGENIC REAERATION IN FLOWING WATERS: 1. LABORATORY COMPARISON OF THE METHODS, (IN GER-

MAN), Bundesanstalt fuer Gewasserkunde, Coblenz

Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany). D. Mueller, and H. Knoepp. Internationale Revue de Gesamten Hydrobiologie, Vol 56, No 1, p 49-67. 1971. English summary. Identifiers: Aeration, Laboratory tests, Measure-ment, Plants, *Analytical techniques, *Primary productivity, *Reaeration.

The amount of O2 produced by green plants (primary production) is of considerable importance in mary production) is of considerable importance in the metabolism of flowing waters. From the sani-tary engineering point of view the gross produc-tion of O2 is not as important as the net production by photosynthesis, the 'biogenic reaeration rate.' This net production, however, cannot be mea-sured by direct methods. Three possible methods sured by direct methods. In the possible methods for primary production measurements were used in simultaneous laboratory experiments, and were investigated as to their suitability for measurements of net O2 production: the light-dark-bottle and C-14 methods currently used in limnology, as well as the electrometrical registration of diurnal well as the electrometrical registration of diurnal O2 curves with membrane covered electrodes. Series of tests were carried out in different ranges of O2 concentration. The production values obtained by these 3 methods coincided fairly. The correlation between values obtained by the C-14 method and the 2 O2 methods was not very satisfactory. The coincidence of values obtained by the light-dark-bottle method with those calculated from resistantion of divinal curves was fairly seed. The dark-bottle method with those calculated from registration of diurnal curves was fairly good. The registration of diurnal curves proved to be especially convenient for the estimation of the primary production of larger flowing waters. The interpretation of diurnal curves according to McCornell's method should be preferred. The influence of gas transfer through the water surface on production values almost compensates itself during a 1 day period; only in the case of very unsymmetrical diurnal curves should allowance be made for this diffusion. The relationship between gross and net productions and their relation to biological aeration are discussed. Contrary to gross producaeration are discussed. Contrary to gross produc-tion, net production cannot be determined precise-ly.—Copyright 1972, Biological Abstracts, Inc. W72-08478

ECOSOCIOLOGICAL INVESTIGATIONS ON THE BERENDONK POND AND ON THE KER-MISDAHL: A CONTRIBUTION TO THE HYDROBIOLOGY OF WATERS OF THE RE-GION OF LOWER RHINE RIVER (IN GER-MAN)

J. Hild, and K. Rehnelt.
Vegetatio. Vol 22 (1-3): p 65-82, 1971. Illus.
Identifiers: Berendonk, *Eutrophication, Germany, *Hydrobiology, Kermisdahl, Ponds, *Rhine River, Vegetation.

Group 5C-Effects of Pollution

The Berendonk pond and the Kermisdahl have waters of different degrees of eutrophication.
Their development depends on the influences of
the Niers or the Rhine River. The former has resulted from peat removal from a fen on the lower terrace of the left bank of the Rhine. The latter is a meander of the Rhine. The vegetation indicate the advanced eutrophication of the pond, but they are poorly developed in and around the Kermisdahl. The different kinds of vegetation in waters is caused by hydrographic-hydrologic conditions, principally currents and current speed, form of the basins and water depth. The hydrochemical conditions give a final explanation for the specific vegetation in both waters. Secondary influences of the Niers and the Rhine cannot be excluded .-- Copyright 1972, Biological Ab-

5D. Waste Treatment Processes

NOVEL WATER TREATING AND STORAGE APPARATUS,
Dow Chemical Co., Midland, Mich. (Assignee).

William C Bauman

U.S. Patent No 3,630,378, 4 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 893, No 4, p 1344, December 28, 1971.

Descriptors: *Patents, *Water treatment, Equipment, Treatment facilities, *Reverse osmosis, *Electrodialysis, Water pollution treatment, Potawater, Pollution abatement, Desalination, *Waste water treatment.

Apparatus consists of a storage vessel for treated water and another for untreated water. A water treatment unit leads from the untreated water to the treated water unit. When treated water is being withdrawn, untreated water at line pressure flows in at the bottom of the first vessel displacing the treated water. When service water is being withdrawn for use, untreated water at line pressure flows in at the top of the second vessel displacing the waste effluent. When no service water or treated water is being withdrawn a pump continues to draw untreated water from the bottom of the first vessel and from the top of the second vessel and feeds it to the water treating unit. (Sinha-OEIS) W72-07976

SEWAGE FILTER UNIT.

Astrotronic Research Ltd. (Canada) (Assignee). Frederick J. Brooks.

U.S. Patent No 3,630,377, 3 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 893, No 4, p 1344, December 28, 1971.

Descriptors: *Patents, Sewage, *Filters, *Filtra-tion, *Bacteria, *Ultrasonic, *Waste water treat-ment, Equipment, *Sound waves, *Sewage treat-ment, Pollution abatement, Water pollution treat-

Identifiers: *Ultrasonic treatment.

The sewage first passes through a bed of aggregate which serves as a screen and reduces the turbu-lence. The liquid then flows upward through a series of filter units which contain screens. After the solid material has been screened from the water. the water is subjected to ultrasonic treatment to destroy bacteria. (Sinha-OEIS) W72-07977

ROTATING BIOLOGICAL WASTE TREAT-

MENT SYSTEM,
Environmental Pollution Control Co., Inc., Oconomowoc, Wis. Robert H. Joost.

U. S. Patent No 3,630,366, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 893, No 4, p 1341, December 28, 1971.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Bacteria, *Biological oxygen demand, Biocontrol, Biodegradation, Water purification, *Sewage treatment, *Liquid wastes, Pollution abatement, Water pollution treatment.

A rotating disc waste treatment system consists of a series of closely spaced vertical discs mounted on a horizontally driven shaft. The shaft is slowly rotated by power driven equipment and alternately dips the disc surfaces into the waste material and then into the air. A biomass is quickly established on the disc surface. The biomass oxidizes the waste material into metabolic byproducts and excess cell material. The treated water containing these solids is directed to a secondary clarifier for separation. (Sinha-OEIS) W72-07978

TRANSPORTABLE LIQUID WASTE TREAT-MENT PLANT, Energy Systems, Inc., Melbourne, Fla.

David D. Woodbridge, Thomas A. Nevin, William R. Garrett, and Leland A. Mann. U. S. Patent No 3,630,365, 4 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 893, No 4, p 1341, December 28, 1971.

Descriptors: *Patents, *Irradiation *Liquid wastes, *Sewage treatment, Gamma rays, Pollution abatement, *Biological treatment, Water pollution treatment, Treatment facilities, Flow systems, *Waste water treatment.

A transportable liquid waste treatment plant may be built in the form of railroad cars or barges or ships. Liquid waste is received in a large tank which provides for mixing of the liquid and for flow regulation to the system. The mixture then enters a biological reactor tank. The mixture next passes into a unit for separating solids. The separated concentrate is removed from the system. The separated effluent may be filtered and the liquid passed through a gamma radiation irradiator. The effluent may then be filtered again to remove dead bacteria and the like. (Sinha-OEIS)

TREATMENT OF SEWAGE.

Texaco Inc., New York (Assignee). Edward L. Cole, and Howard V. Hess. U. S. Patent No 3,507,788, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 873, No 3, p 888, April 21, 1970.

Descriptors: *Patents, *Sewage treatment, Equipment, *Organic wastes, Chemical oxygen demand, *Oxidation, Pollution abatement, Water pollution, *Waste water treatment, Water treatment, Water quality, *Industrial wastes, *Municipal wastes, Separation techniques.

Biological sewage wastes are treated by carbonizing water-soluble and water-insoluble organic matter with heat under elevated pressure in the absence of free oxygen to form solid coke. After the solid coke is removed, the remaining treated waste water is subjected to oxidation at elevated temperature and pressure to yield effluent of low COD. (Sinha-OEIS) W72-07980

WATER SLUDGE SEPARATION SYSTEM AND

Dorr-Oliver, Inc., Stamford, Conn. (Assignee). Peter Frederick Johnson

U. S. Patent No 3,504,795, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 873, No 1, p 125, April 7, 1970.

Descriptors: *Patents, Separation techniques, Sludges, Water pollution treatment, Pollution abatement, *Sewage treatment, *Sewage sludges, A tank has an impervious bottom and side walls and is divided into at least two compartments by a vertical perforated partition. Sludge to be thickened and support liquid are fed into their respective compartments so that the level of each rises at the same rate. As the liquid level in the draw compartment drops, the water bands in the sludge compartment flow through the partition into the draw off. The operation is continued until all water bands are removed. The thickened sludge is removed and the cycle renewed. (Sinha-OEIS) W72-07981

WATER TREATMENT PROCESS FOR IMPROVED GRAVITY FILTERING AND BACKWASHING, Roderick M. Willis, and Charles L. Oldfather. U. S. Patent No 3,506,125, 2 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 873, No 2, p 457, April 14, 1970.

Descriptors: *Patents, *Filters, Water purifica-tion, Pollution abatement, Water pollution treat-ment, *Waste water treatment, *Filtration, Water treatment, Aeration, Bubbles.

Identifiers: *Air bubbles, Backwash water, *Gravity filters.

Pressurized water saturated with air or other gas is injected into the downflowing water above the filter media. Air bubbles attach themselves to filterable particles and float them to the surface for removal. The same procedure occurs during the backwash cycle when air bubbles are injected into the upflowing backwash water. (Sinha-OEIS) W72-07982

INFRASONIC ACTIVATION OF DESALINA-TION MEMBRANES, For primary bibliographic entry see Field 03A. W72-07983

APPARATUS FOR PURIFYING WASTE

APPARATUS FOR PURIFYING WASTE WATER, August Schreiber. U. S. Patent No 3,495,712, 4 p, 11 fig, 3 ref; Patent Abstracts Section, Official Gazette Vol 871, No 3, p 808, February 17, 1970.

Descriptors: *Patents, Equipment, *Waste water treatment, *Aeration, Pollution abatement, Water pollution treatment, *Sludge treatment, Water purification, Aerated lagoons.

An aeration tank is fitted with a movable ventilating device which includes a frame that carries a baffle or damming device for imparting the horizontal flow to the sludge and waste water mixture. It may also have a ventilator at the bottom to force air bubbles to rise through the stream of ac-tivated sludge and waste water. (Sinha-OEIS) W72-07984

PROCESS FOR WASHING OPEN OR GRAVITATIONAL FILTERS FOR THE PURIFICATION OF WATER, Andre R. Resonnet.

Aldre R. Resonner. U. S. Patent No 3,503,505, 2 p, 6 fig, 3 ref; Patent Abstracts Section, Official Gazette Vol 872, No 5, p 1522, March 31, 1970.

Descriptors: *Patents, Filters, *Water purifica-tion, Equipment, *Filtration, *Waste water treat-ment, Pollution abatement, *Water treatment. Identifiers: *Gravity filters.

An elongated coffer opening downward has a device for the injection of washing water. The coffer is pivotally suspended on a mobile bridge. A series of nozzles fed by pipes conduct the wash water into the filtering layers below. The dirty water is drawn off by a separate pipe system. (Sin-W72-07985

REVERSE OSMOSIS APPARATUS, Desalination Systems, Inc., San Diego, Calif. (As-For primary bibliographic entry see Field 03A. W72-07986

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METHOD AND EQUIPMENT FOR ACTIVATED SLUDGE PROCESSING OF SEWAGE, Passavant-Werke (Germany). (Assignee). Josef Huber Kilchberg. U. S. Patent No 3,505,212, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 873, No 1, p 217, April 7, 1970.

Descriptors: *Patents, Equipment, *Sewage treat-ment, *Activated sludge, *Aeration, Pollution abatement, Biodergradation, Sludge treatment, Treatment facilities, Water pollution treatment, *Waste water treatment, Water treatment, Sewage

Effluent from the primary settling tank is introduced into a first phase tank in which it is mixed troduced into a trist phase tank in which its mixed with return sludge to provide a heavily loaded but lightly concentrated mixed liquor which is aerated, mixed and concentrated. In the second phase tank, conditions should be favorable for precipitation so that the effluent may be relatively free of suspended solids. Continuous circulation is mainsuspended solids. Continuous circulation is maintained in both treatment phases but at different velocities and flow patterns. This provides high biological efficiency while reducing the power requirements for aeration and circulation. (Sinha-OEIS) W72-07987

METHOD AND APPARATUS FOR PURIFYING A NATURAL BODY OF WATER, Martin Marietta Corp., New York. (Assignee). Harold V. Anthony, and George P. Fulton. U. S. Patent No 3,905,213, 7 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 873, No 1, p 217, April 7, 1970.

Descriptors: "Patents, "Water purification, Heat exchangers, "Oxidation, Pollution abatement, "Dissolved oxygen, "Waste water treatment, Water pollution treatment, Equipment.

A method and apparatus are provided for adding oxygen and other matter to a natural body of water to accelerate and increase the efficiency of the ox-idation of pollutants. Liquid oxygen is converted into a gaseous state and is then diffused into the mind a gaseous oxidation catalysts and gaseous oxidizing agents are used to increase the efficiency of the process. (Sinha-OEIS) W72-07988

METHOD OF TREATMENT OF LIQUIDS BY REVERSE OSMOSIS, Desalination Systems, Inc., Escondido, Calif. (As-

signee).

For primary bibliographic entry see Field 03A. W72-07989

PROCESS FOR THE DESTRUCTION OF CYA-NIDE IN WASTE SOLUTIONS, Enthone, Inc., West Haven, Conn. (Assignee). John L. Morico.

U. S. Patent No. 3,505,217, 6 p, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol. 873, No. 1, p. 218, April 7, 1970.

Descriptors: *Patents, *Waste water treatment, *Chemical wastes, Pollution abatement, *Industri-Identifiers: *Cyanide, *Aldehyde.

The waste solution containing cyanide is mixed with one or more aldehydes and/or a water soluble bisulfite addition reaction product at room temperature until the cyanide has been converted into a nontoxic form. The term aldehyde is used in a broad sense to indicate also polymers of aldehydes such as paraformaldehyde and paraldehyde and

substances which yield the aldehyde per se. (Sinha-OEIS) W72-07990

PROPOSED SEWAGE TREATMENT FACILITIES, SOLDOTNA, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, Seattle, Wash.

Available from the National Technical Informa-tion Service as PB-204 662-D, \$3.00 in paper copy, \$0.95 in microfiche. December 7, 1971. 11 p, 2

Descriptors: *Environmental effects, *Alaska, Sewage disposal, "Sanitary engineering, "Treat-ment facilities, Sewage, Municipal wastes, Sewage effluents, Sewage treatment, Waste water disposal, Aeration, Chlorination, Septic tanks, Water pollution, Sucrees, Water quality, Water pol-lution, Interceptor sewers, Rivers, Aquatic habitats.

Identifiers: *Environmental impact statements, *Kenai River (Alas.).

Soldotna, Alaska proposed construction of a city Soudona, Alaska proposed construction of a city sewage collection system, including interceptor sewers, a sewage lift station, a new extended aeration process sewage treatment plant, and chlorination. Treated effluent will be discharged to the main channel of the Kenai River. The project will have a nealicible investor to the Piurs heaves are main channel of the Kenai River. The project will have a negligible impact on the River because raw sewage which presently reaches the River will be eliminated. Interceptor lines have been located only through lands lacking historical or special scenic value. No wastes will be discharged in the air; the extended aeration process should eliminate any odor problems. Any adverse impact should be about tern and terminate with the construction. any odor problems. Any adverse impact should be short term and terminate with the construction phase. Alternatives include development of a regional sewage system, selection of other plant sites and treatment types, and no action. However, the only viable alternative which projected less impact on the aquatic environment was pragmatically and financially prohibitive. The three construction and design changes suggested by other agencies will be incorporated in the project. Comments of interested agencies are included. (Kohla-Florida) W72-08017 W72-08017

RESULTS OF STUDYING WINTER IRRIGA-TION ON DRAINED IRRIGATED AGRICUL-TURAL FIELDS (REZUL'TATY ISS-LEDOVANIY PO ZIMNEMU OROSIENIYU NA DRENIROVANNYKH ZEMLEDEL'CHESKIKH POLYAKH OROSHENIYA), Severnyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR). Va 7 Sheveley

Ya. Z. Shevelev. Pochvovedeniye, No 7, p 83-91, July 1971. 3 fig, 4 tab, 8 ref.

Descriptors: *Land reclamation, *Irrigated land, *Return flow, *Irrigation practices, *Drainage systems, Subsurface drainage, Drains, Drainage water, Irrigation water, Rates of application, Frozen soils, Freezing, Thawing, Melt water, Snowmelt, Moisture content, Permeability, Infiltration, Winter, Spring. Identifiers: *USSR, Leningrad Oblast.

Investigations were conducted in 1962-66 on drained irrigated fields of the Detskosel'skiy Sovkhoz in the Leningrad Oblast to study water regime and effectiveness of subsurface drainage regime and effectiveness of subsurface drainage on irrigated land, water permeability of frozen soils, soil freezing and thawing during waste-water irrigation, and winter irrigation practices. The drainage network is a system of permanent asbestos-cement pipes with outlets spaced 120 m apart. Irrigated plots are drained by subsurfact drains installed at depths of 0.5 to 1.5 m at intervals of 10 to 30 m. Winter irrigation with waste water can be performed on both coarse- and finetextured soils, provided the melt water in spring is

discharged by surface runoff. Winter irrigation with waste water is effective in zones of both deficient and excess moisture provided water is removed from fields through tile drains. Winter irrigation is best performed in a single application; two applications retard complete soil thawing by 10-15 days. Maximum drainage occurs in areas where drains are shallow and a small distance apart. Public health regulations permit irrigation of all crops with waste water during the nongrowing period. (Josefson-USGS)

SEWAGE NUTRIENT REMOVAL BY A SHAL-LOW ALGAL STREAM, National Inst. for Water Research, Pretoria (South

J. Hemens, and M. H. Mason. Water Research, Vol. 2, No. 4, p 277-287, 1968. 5 fig, 1 tab, 28 ref.

Descriptors: *Algae, *Nitrogen, *Phosphorus, *Sewage effluent, *Sewage treatment, *Nutrient removal, *Water reuse, Seasonal, Water treat-Identifiers: *Sewage nutrient removal.

The use of algae ponds for removing nitrogen and phosphorus by assimilation from secondary sewage effluent suffers from the disadvantage of inefficient light utilization by the dense algal cutures required and from the practical problem of economically removing the algae from suspension. An experiment is described in which the pH increase resulting from algal photosynthesis in a shallow stream was used to remove phosphate by precipitation and nitrogen by assimilation and loss to the atmosphere as ammonia gas. Association of precipitation and nitrogen by assimilation and loss to the atmosphere as ammonia gas. Association of precipitated phosphate with the algal cells produced a granular algal sediment easily removed by gravity settlement. Removal of nitrogen and phosphate exceeded 90 per cent in the warmer seasons but at winter temperatures the efficiency was less, due to decrease in the elevation of pH value. The method appears to have possible application for rural communities in equable climates where water re-use is desirable. (Skogerboe-Colorado State)

PROPANE CLARIFICATION AIDS LUBE OIL

PROFANE CLARIFICATION AIDS LUBE OIL RECLAMATION, Institut Francais du Petrole, Paris. R. Dutriau, and D. V. Quang. Chemical Engineering, Vol. 79, No. 4, p 54-55, February 21, 1972. 2 fig, 1 tab.

Descriptors: *Propane, Oil, Chemical wastes, *Oil wastes, Oil industry, Separation techniques, Lubricants, *Waste water treatment, Water reuse. Identifiers: *Clarification, *Lubricating oil.

The Institut Francais du Petrole (IFP) has developed a process incorporating propane clarification of lube oil prior to conventional acid/clay treating. The Viscolube Italiana Company uses a 5 stage manufacturing train: predistillation, propane clarification, acid treatment, distillation, and finishing. Only the second stage employs the IFP process. In operation, dehydrated and preheated oils from the predistillation unit are mixed with liquid propane and sent into the reactor. Propane containing the dissolved oils is sent off overhead while residues are taken off at the bottom. Propane is separated from oil in a 2-stage flash and sent to the propane unit to be liquified before recycling. The clarified oil is sent to acid and clay treating units. Advantages are decreased usage of acids and clay, increase in yield, and increase in oil quality. (Mackan-Battelle) The Institut Français du Petrole (IFP) has

DESIGN AND FABRICATION OF A FLIGHT-CONCEPT PROTOTYPE ELECTROCHEMI-CAL WATER RECOVERY SYSTEM, McDonnell Douglas Astronautics Co., Huntington

Group 5D—Waste Treatment Processes

D. F. Putnam, and R. L. Vaughan. D. F. Putnam, and R. L. Vaugnan.
Available from the National Technical Informa-tion Service as N-71 36507, \$3.00 in paper copy, \$0.95 in microfiche. NASA Contract Report No. CR-111961, MDCG-2351, September 1971. 80 p, 36 fig, 22 tab, 20 ref. NASA Contract NAS-1-8954.

Descriptors: *Water reuse, *Urine, *Electrodialysis, Electrolysis, Separation techniques, Water purification, Research and development, Laboratory tests, Design criteria, Activated carbon, Operation and maintenance, *Waste water treatment. Identifiers: *Chemical treatment.

A six-man flight-concept water recovery system, using electrolytic pretreatment followed by elec-trodialysis to purify human urine and convert it to high quality drinking water was designed and fabricated. A 30-day continuous test of the system conclusively demonstrated its self-sterilizing features, its ability to produce potable water, and established the following advantages over cur-rently used chemical treatments, namely: (1) storage for corrosive pretreatment chemicals is eliminated; (2) higher recovered water yields are possible since solids are removed by the process;
(3) the process provides a sterile, inert raw liquid initially, and a clean brine at the end of processing; (4) ammonia levels in the product water are reduced; (5) the system withstands boiling temperatures over 140 Jegree F without breakdown or formation of volatile contaminants; and (6) it converts dissolved organic materials in the urine into useful cabin gases. Areas needing improvement were also indicated by the testing, and solutions to the problems are discussed. (Lowry-Texas) W72-08145

REMOVAL OF OIL FROM SEA WATER, AMF Beaird, Inc., Uncasville, Conn.

J. A. Hefler.

Available from the National Technical Information Service as Com-71-01095, \$3.00 in paper copy, \$0.95 in microfiche. 1971, 74 p, 20 fig, 23 tab, 4 ref. Contract MA-4152.

Descriptors: *Oily water, *Separation techniques, *Filtration, *Oil wastes, Prototype tests, Particle size, Flow rates, Viscosity, Drops (Fluids), Mix-ing, Dispersion, Pumps, Oil spills, Oil-water interfaces, Baffles, Coalescence, Water quality con-trol, Filters, *Waste water treatment. Identifiers: *Ballast tanks, *Cartridge filters.

A commercial, self-cleaning cartridge filter was evaluated and tested to develop a prototype system capable of separating oil-water mixtures. such as occur in oil tanker ballasting tanks. Throughput, fineness of dispersion, and concentration of oil in the water were demonstrated in laboratory testing to be the most important system parameters. Temperature density difference, and cleaning rate were significant but less importance than the first three parameters. Introduction of baffles to the systems was shown to be of considerable importance, since the cartridge filters and the baffles exhibited synergistic effects. How-ever, finely dispersed oil droplets (.002 inch in diameter) are not capable of separation with the present cartridge-baffle system. Effluent from the deballasting pumps contains much finely dispersed oil, and if the cartridge system is to be used it must be placed between the ballast tanks and the de-ballasting pumps. Physical size limitations with the cartridge filter systems makes such installation unfeasible at this time. (Lowry-Texas) W72-08146

WASTEWATER TREATMENT TECHNOLOGY, Illinois Inst. for Environmental Quality, Chicago. J. W. Patterson, and R. A. Minear. Available from the National Technical Informa-

tion Service as PB-204 521, \$3.00 in paper copy, \$0.95 in microfiche. Report No. 71-4, August 1971, 279 p, 20 ref

Descriptors: *Water pollution sources, *Separation techniques, *Industrial wastes, *Municipal

wastes, Dissolved solids, Phenols, Hydrogen ion concentration, Heavy metals, Oily water, Information retrieval, Water treatment, *Waste water treatment, Cost analysis, Research and development, *Reviews.

A literature search was conducted to determine how the following substances enter water bodies as pollution and how they are removed. The substances studied include arsenic, barium, boron, cadmium, hexavalent chromium, trivalent chromium, copper, cyanide, fluorides, soluble iron, total iron, lead, manganese, nickel, oily wastes, pH control, phenols, selenium, silver, total dissolved solids, chloride, and zinc. For each substance, the information includes: (1) what industries and/or natural occurrences cause the incidence of the substance as a pollutant; (2) what concentrations of the substance have been recorded previously; (3) what problems are caused by excessive amounts of the substance in water; (4) what methods of treatment are available for separating the substance from the water; and (5) how much the various alternatives cost. In some instances, no information was available on one or more of the preceding points, but most of the substances have been well documented previously. (Lowry-Texas) W72-08147

SHIPBOARD SEWAGE TREATMENT SYSTEM, General Dynamics Corp., Groton, Conn. Electric

James R. Bailey, Ivars Bemberis, P. J. Hubbard, and John Presti.

Available from the National Technical Information Service as AD-733 082, \$3.00 in paper copy, \$0.95 in microfiche. Report U413-71-059, November 12, 1971, 62 p, 12 fig, 9 tab, 5 ref. Contract N00024-71-C-5329.

Descriptors: *Waste water treatment, *Activated sludge, Membranes, Suspended solids, Tempera-ture, Salinity, Toxicity, Coliforms, Biochemical oxygen demand, Activated carbon, Operation and maintenance, Design criteria, Ships, *Sewage treatment.

Identifiers: *Ultrafiltration, *Shipboard sewage

An activated sludge-ultrafiltration unit was tested under simulated shipboard conditions to develop design data for a prototype 200 man system for shipboard installation and testing. Effluent average BOD for the entire test was less than 10 mg/l, effluent suspended solids content was zero, and bacteria were filtered out by the membrane. Rapid variations of system operating tempera-tures, from 39 to 113 degrees F, and salinities, from fresh water to salinities of 5.8%, as well as additions of disinfectants, cleaning agents, pesti-cides and solvents, demonstrated the system to be remarkably stable under adverse and varying environmental conditions. The reactors, screen, and membrane modules were subjected to influents containing 40,000 mg/1 without loss of efficiency or difficulties with equipment operation. Instantaneous start-up with activated carbon was also demonstrated. Preliminary design calculations in-dicate that a system capable of serving 200 shipboard men will meet the reliability and maintainability criteria, require little operating attention, and occupy and 8 ft by 8 ft by 6 ft high volume. (Lowry-Texas)
W72-08148

REGIONAL MANAGEMENT OF WASTE SYSTEMS-ONE STATE'S APPROACH, Maryland Environmental Service, Annapolis For primary bibliographic entry see Field 05G. W72-08149

TREATING LEAD AND FLUORIDE WASTES.

Environmental Science and Technology, Vol 6, No 4, April 1972, p 321-322, 3 fig.

Descriptors: *Industrial wastes, *Lead, *Fluorides, Solubility, Chemical precipitation, Separation techniques, Hydrogen ion concentration, *Waste water treatment, *Cleaning, Public health, *New York. Identifiers: *Cathode ray tubes, *Etching, *Elmira

Production of color television tubes at the Elmira, New York, plant of the Westinghouse Electric Corporation involves the use of hydrofluoric acid to clean, etch, and prepare glass surfaces, and the use of lead as a lead solder glass sealant. When flaws are discovered in the tubes, they must be disassembled by dissolving or weakening the lead solder bond. As a result of these operations, 10,000 to 15,000 gallons of lead wastes and 75,000 to 80,000 gallons of fluoride wastes are discharged daily. To meet effluent standards of 1/500 of 1 ppm for lead and 1.5 ppm for fluoride, the following treatment program was devised. Initially, the wastes are separated, and the lead wastes are treated with trisodium phosphate at pH 3.6 to form insoluble lead phosphate. This treated waste, with lead phosphate in suspension, flows into the fluoride reaction tank, to which fluoride wastes, lime (to maintain pH 12) and a polyelectrolyte are added, causing the formation of insoluble calcium fluoride. The mixture flows through six cascade tanks for solids removal and the effluent contains 0.2 ppm lead and 10-30 ppm fluoride which, when mixed with the remaining plant effluent, is within drinking water standards. The excess lime, calcium fluoride, and lead phosphate sludge is being landfilled, but research into better final disposal methods and reduction of lime usage is continuing. (Lowry-Texas) W72-08150

NAVY ADVANCED WASTE TREATMENT SYSTEM PHASE I, FINAL REPORT, Thiokol Chemical Corp., Brigham City, Utah.

Wasatch Div. Paul D. Nance, Tom O'Grady, Howard McIntosh,

Available from the National Technical Informa-tion Service as AD-735 095, \$3.00 in paper copy, \$0.95 in microfiche. Publications No. 1271-34506A, December 22, 1971. 176 p, 60 fig, 23 tab. N00024-71-C-5332.

Descriptors: *Ships, *Domestic wastes, *Waste water treatment, *Suspended solids, Biochemical oxygen demand, Coliforms, techniques, Centrifugation, *Oxidation, Catalysts, *Ultraviolet radiation, Electrolysis, *Incineration, Chemical reactions, Prototype tests, Research and development, *Tertiary treatment.

A 200-man advanced photochemical waste treatment prototype was designed and constructed. Major components of the system include: (1) pretreatment to remove large solids and foreign objects; (2) a high efficiency centrifuge to remove suspended solids; (3) an incinerator based upon aerospace combustion technology to destroy collected solids; (4) PEPCON (Pacific Engineering Production Company of Nevada) electrolytic cells to generate chemicals for oxidizing dissolved solids and to destroy bacteria; (5) an ultraviolet photochemical cell or chemical catalyst to ac-celerate the reaction rates between oxidizing chemicals and dissolved solids. The 200-man system was designed to treat 5200 gpd of sewage containing 600 mg/l BOD and 800 mg/l suspended solids. Tests showed that effluent from the system contained 80 mg/l of suspended solids, less than 50 mg/l BOD, and nearly zero coliforms. A parallel program was conducted substituting a catalyst for the UV cells, with no loss of efficiency and a significant size reduction. (Lowry-Texas) W72-08151

SEWER MAINTENANCE METHODS, Spokane Dept. of Public Works, Wash. James W. Day.

Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 15, No. 5, San Francisco, California, October 6, 1971,

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Descriptors: *Sewerage, *Sewage systems, *Operation and maintenance, Cleaning, Repairing, Equipment, Personnel management, Waste water treatment, *Washington. Identifiers: *Blockages, *Rodding, *Balling, *Spokane (Wash).

A review of techniques and equipment used in maintaining sewer service to the population of Spokane, Washington, is presented. The flexible steel rod is suggested as perhaps the most universal tool for sewer maintenance, having evolved since the 1930's from a hand rod and ratchet to the continuous rod rodder. Rodding equipment is used primarily for removal of roots and other large objects, while balling is the primary method for removal of sand and gravel. Rodding and balling on alternate years has produced excellent results for sewer operation. Other maintenance and inspection methods, including closed circuit television are discussed, but the one factor which must receive the ultimate attention is the personnel, receive the ultimate attention is the personnel, since even the best equipment, handled in a haphazard fashion, will not get the job done right. (Lowry-Texas) W72-08152

FULL SCALE ANAEROBIC FILTER TREAT-MENT OF WHEAT STARCH PLANT WASTES, Environmental Protection Agency, Corvallis,

Oreg. Dennis W. Taylor, and Robert J. Burm. Preprint, presented at American Institute of Chemical Engineers 71st National Meeting, Dallas, Texas, February 20-23, 1972, 18 p, 4 fig, 7 tab,

Descriptors: *Industrial wastes, *Biodegradation, *Filtration, *Anaerobic conditions, Rocks, Separation techniques, Alkalinity, Nitrogen, Phosphorus, Suspended solids, Hydrogen ion concentration, Organic loading, Odor, Methane, Sedimentation, *Waste water treatment, *Washington. Identifiers: *Wheat starch wastes, *Spokane (Wash), *Anaerobic filters.

(Wash), *Anaerobic filters.

A full-scale, rock-filled anaerobic filter was used successfully for the treatment of wheat starch plant wastes at the Centennial Mills plant in Spokane, Washington. Raw waste characteristics included 90 gpm flow containing 8800 mg/l of COD and 6500 mg/l of BOD, pH greater than 7.0, 70 deg. F, 370 mg/l TKN, 20 mg/l ammonia nitrogen, 75 mg/l total phosphorus as P, and 2650 mg/l of suspended solids. The filters were wood-stave tanks 30 ft in diameter and 20 ft high. Rock sizes in the top half ranged from 1 to 2 inches and from 2-3 in. in the bottom half. The filters were operated at 85 to 90 deg. F at loading rates of 210 lb BOD5/1000 ft3/day. Greater than 60% organic removal was obtained with an average suspended solids concentration of 2600 mg/l in the influent. Neither upset conditions nor reduced organic removals were observed with pH levels down to 5.4, and potential odor problems can be controlled. In addition, no loss of efficiency was observed after a one-month 'resting' period. At a total cost of \$110,000, the system has been shown to be an economic and efficient means of treating highly variable high strength wheat starch plant waste. (Lowry-Texas) (Lowry-Texas) W72-08153

TREATMENT OF ORGANIC CHEMICAL PLANT WASTEWATER WITH THE DU PONT PACT PROCESS,

PACT PROCESS,
Du Pont de Nemours (E. I.) and Co., Deepwater,
N.J. Organic Chemicals Dept.
Francis L. Robertaccio, David G. Hutton, Gary
Grulich, and Herman L. Glotzer.
Preprint presented at American Institute of
Chemical Engineers 71st National Meeting, Dallas, Texas, February 20-23, 1972, 13 p, 14 fig.

Descriptors: *Industrial wastes, *Laboratory tests, *Tertiary treatment, Activated carbon, Adsorption, Activated sludge, Mixing, Monitoring, Design criteria, Sludge, Cost comparisons, Flow rates, Pilot plants, *Waste water treatment, *New Jersey, 'Organic compounds. Identifiers: *DuPont PACT process, *Carbon regeneration, *Deepwater (NJ).

regeneration, *Deepwater (NJ).

Wastewater from the Chambers Works of the E. I. DuPont de Nemours Company is produced in the manufacture of fluorinated hydrocarbons, petroleum additives, dyes, and various aromatic intermediates. A fraction of this exceedingly complex waste, containing most of the biodegradable organics of the waste, was used for laboratory scale testing of the DuPont PACT process, a process involving the addition of powdered activated carbon to the aeration basin of a conventional activated sludge plant. The plant received neutral primary effluent, and parameters measured included flow rates, temperature, mixed total and volatile suspended solids, BOD, COD, TOC, metals concentrations, color, and toxicity. Variables investigated were aeration time, carbon dosage, temperature, and the effects of deiiberate upsets, such as heavy metals. The PACT process was shown to be capable of providing tertiary-quality treatment in secondary facilities with the addition of only a mixing tank and a pump, while concurrently aroxiding greater, oversident greater, overside treatment in secondary racinties with the addition of only a mixing tank and a pump, while concurrently providing greater operational control over the level of treatment obtained. At low dosages, the carbon can be used economically (4-8 cents/1000 gallons) on a once through basis, while eems/1000 gailons) on a once through basis, while at high dosages there is the possibility of recovery. Future work will include pilot plant investigation to establish design criteria and comparative economics. (Lowry-Texas)
W72-08154

PROCESS DEVELOPMENT, DESIGN, AND FULL-SCALE OPERATIONAL EXPERIENCE AT A PETRO-CHEMICAL MANUFACTURING WASTEW ATER TREATMENT PLANT, Weston (Roy F.), Inc., West Chester, Pa. G. B. Vania, M. N. Bhatla, A. F. Thompson, Jr., and C. W. Prabston.

and C. W. Brabston.

Preprint presented at 44th Annual Conference of Water Pollution Control Federation, Session 3, No. 5, San Francisco, California, October 1971, 17 p, 8 fig, 7 tab.

Descriptors: *Oily water, *Chemical wastes, *Design criteria, *Oil wastes, Sampling, *Neutralization, *Aerated lagoons, Filtration, Vacuum drying, Lime, Operation and maintenance, *Waste water treatment, *Texas. Identifiers: *Influent variability, *Operational flexibility, Consulting engineers, *Clarification, Equalization, *Deer Park (Tex).

Wastewaters from the Lubrizol Corporation's plant at Deer Park, Texas, are generated by the production of a wide variety of chemical additives for the petroleum industry. Process wastewaters include distillation waste streams, spent scrubber waters, reactor washdowns, and filter press cake drainage. Other sources include wastes from tank car loading, unloading, and washing operations; water softener discharges; boiler blowdown; and leakage from tank farm areas. Sampling of the effluent was conducted from a mobile laboratory, and design treatability studies were performed to evaluate different treatment processes. One major difficulty encountered was the fact that many of the products produced would be short-lived, and in production less than a year. This required the plant design to include maximum flexibility of operation. A combination of oil separation, equalization, neutralization, and primary clarification was selected, constructed, and has been functioning well as stable primary treatment for a highly variable wastewater. Removal of organic material is being accomplished in an aerated lagoon, and effective vacuum filtration of waste solids is being practiced by adding one to two parts of lime per part of dry solids processed. The consulting engineers were retained both to design and operate the system, and the arrangement has been in the best interests of both parties. (Lowry-Texas) and design treatability studies were performed to

W72-08155

EVALUATION OF AN OZONATION-A-CTIVATED CARBON TREATMENT FOR A COLORED INDUSTRIAL WASTE, Iowa State Univ., Ames. Jack Kaspar Gregersen. Master's Thesis, 1971, 114 p, 31 fig, 8 tab, 48 ref.

Descriptors: "Chemical wastes, "Color, "Separation techniques, Phenols, Anaerobic conditions, Filtration, "Adsorption, "Activated carbon, "Oxidation, Ozone, Clays, Organic loading, Hydrogen ion concentration, Economic feasibility, "Waste water treatment, Aromatic compounds.

Identifiers: "Anilines, "Nitrophenols,

A variety of physical and chemical treatment methods for eliminating color from a chemical waste were investigated. The color-causing compounds in the waste were primarily aromatic com-pounds, including nitrophenol and nitroanilines. Methods of removal investigated included adsorp-Methods of removal investigated included adsorption on clay and activated carbon, oxidation with ozone, and irrigation. Activated carbon adsorption was demonstrated to be the best process for immediate applications, since all necessary equipment and design information is currently available. However, operating results using various mesh sizes of granular activated carbon are needed for a more thorough evaluation of process feasibility as well as information on the feasibility of reactivation of the spent carbon. The oxone-biological well as information on the feasibility of reactiva-tion of the spent carbon. The ozone-biological treatment combination also showed considerable promise, but the biodegradability of ozonated color compounds in the wastes has yet to be established. Finally, the anaerobic filter system should be investigated, since it is potentially the most economic system available. (Lowry-Texas) W72-08156

URBAN STORM RUNOFF AND COMBINED SEWER OVERFLOW POLLUTION, SACRAMENTO, CALIFORNIA. Envirogenics Co., El Monte, Calif.

Copy available from GPO Sup Doc EP2.10:11024FKM 12/71, \$1.75; microfiche from NTIS as PB-208 989, \$0.95. Environmental Protec-tion Agency, Water Pollution Control Research Series, December 1971, 193 p, 64 fig, 33 tab, 13 ref. EPA Program 11024FKM 12/71, Contract 14-

Descriptors: "Combined sewers, "Separated sewers, "Storm runoff, "Waste water treatment, Comparative benefits, Comparative costs, Data processing, Statistical methods, "Computer models, Design criteria, Cost analysis, Performance, Water quality control, "California. Identifiers: "Sacramento (Calif).

Necessary data are not available in most areas to determine or predict distributions of storm water runoff and combined sewage flows and pollutant concentrations. To alleviate this problem, a procedure was developed to permit rapid, economical, and accurate assessments of system economical, and accurate assessments of system performance based on 3 different and important water quality criteria. The first criterion establishes an absolute maximum pollutant concentration which cannot be exceeded. The second criterion establishes an acceptable distribution of pollutant concentration by specifying the greatest frequency of occurrence for a particular concentration value. The third criterion establishes the maximum acceptable excession frequency for a particular pollutant frequency. A computer model was then used with a modified rational runoff method to perform preliminary design tasks and weigh alternatives to the designs. The least costly system developed for the Sacramento area incorporated existing and future combined sewers for porated existing and future combined sewers for conveyance with treatment for the combined wastewater, since storm runoff has a chemical composition similar to that of raw sewage. (Low-

Group 5D—Waste Treatment Processes

EFFECT OF INDUSTRIAL AND DOMESTIC EF-FLUENTS ON THE WATER QUALITY OF THE COUER D'ALENE RIVER BASIN. For primary bibliographic entry see Field 05B. W72-08163

METHOD OF TREATING LIQUID WASTES,

U. S. Patent No. 3,520,802, 2 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office Vol. 876, No. 3, p 604, July 21, 1970.

Descriptors: *Patents, *Liquid wastes, *Biochemical oxygen demand, *Nitrogen, Pollu-Descriptors: tion abatement, Organic compounds, Waste water treatment, Water pollution treatment, Industrial wastes, *Nutrient removal, Anaerobic conditions, Domestic wastes, Farm wastes.

Liquid wastes are treated under anaerobic conditions to reduce their biochemical oxygen demand. The wastes are introduced into a closed airtight chamber containing a sludge of high protein con-tent. Liquid wastes and sludge are mixed until the pH has been reduced from about 2.0 to about 3.5 pri nas ocen reduced from about 2.0 to about 3.5 and the treated liquid waste is withdrawn. The process is repeated, thereafter continuously removing sludge from a zone of the chamber and reintroducing it at a lower rate of speed for another time period in the chamber. (Sinha-OEIS) W72-08165

WATER PURIFICATION APPARATUS, Western Mechanical, Inc., Spokane, Wash. (As-

W. E. Lindman. U. S. Patent No. 3,521,752, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office Vol. 876, No. 4, p. 855, July 28, 1970.

Descriptors: *Patents, Water purification, Filters, Settling tanks, *Sewage treatment, *Waste water treatment, Oxygen, Pollution abatement, Neutralization, Precipitation, Water pollution treatment, Gases, Chemical treatment.

A gaseous mixture containing oxygen and sulphur dioxide is passed through waste water. After neutralization the insoluble solids are precipitated. The apparatus includes primary treatment tanks wherein a constant flow of waste water is agitated by the passage of the sulphur dioxide and the oxygen. The atmosphere within the tanks is part of a closed recirculating gas system. The waste water is directed to tanks for the addition of alkaline chemicals for neutralization and precipitation. (Sinha-OEIS) W72-08169

SEPARATION OF LIQUID ORGANIC MATERI-

ALS FROM SUBSTRATES, Dow Chemical Co., Midland, Mich. (Assignee). For primary bibliographic entry see Field 05G.

METHOD OF GETTING RID OF MALODOROUS AIR AND WATER POLLUTANTS FROM ALKALINE PULP COOKING, Uddeholms A.B. Degerfors Jarnverk (Sweden). (Assignee).

A. S. Lindberg. U. S. Patent No. 3,520,772, 2 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office Vol. 876, No. 2, p. 575, July 14, 1970.

Descriptors: *Patents, *Industrial wastes, *Pulp wastes, *Sulfates, *Gases, Air pollution, Water pollution treatment, Pollution abatement, *Odor.

An alkaline sulfate pulping process consists of rendering innocuous the gases usually emitted dur-ing cooking in a continuous digester. Gases are mixed with steam, superheated in a heat exchanger and passed directly to a combustion furnace. A flue gas scrubber may recover the heat content of the steam. (Sinha-OEIS)

PROCESS AND APPARATUS FOR REMOVING FLOATING WASTES FROM WATER SUR-

FACES,
D. Bucchioni, and M. F. De Toffoii.
U. S. Patent No. 3,517, 812, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office Vol. 875, No. 4, p. 823, June 20, 1970.

Descriptors: *Patents, *Oily wastes, *Flotsam, *Separation techniques, Pollution abatement, Water pollution treatment, *Water pollution, Equipment, *Oil pollution, Gravity, Waste water Identifiers: Decantation tanks.

By channeling the upper layers of the water to be cleaned through a defined path with increasing depth, the water is forced to pass under a floodgate lowered to a selected depth. There follows a decreased flow rate and stagnation of the circulation in the zone upstream of the floodgate. The solid and liquid wastes are removed and led into decantation tanks. (Sinha-OEIS)

PROCESS FOR SEPARATION OF OIL FILMS FROM WATER, Shell Oil Co., New York. (Assignee).

A. C. Evans.
U. S. Patent No. 3,518,183, 3 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office Vol. 875, No. 4, p. 906, June 30, 1970.

Descriptors: *Patents, *Separation techniques, Pollution abatement, Oil spills, Oil pollution, Sea water, *Oil wastes, Water pollution, *Polymers, Elastomers, Waste water treatment. Identifiers: Block copolymers.

A highly porous form of a block copolymer is applied to the oil film on the water surface. It is designed to absorb oil within the interior portions as well as on the exterior surface. The block copolymers comprise copolymers of monovinyl arenes and conjugated dienes having at least two non-elastomeric monovinyl arene polymer blocks separated by a conjugate diene polymer block, as well as hydrogenated derivatives of these block polymers. (Sinha-OEIS) W72-08175

LIQUID WASTE TREATMENT PROCESS,

C. Beer. U. S. Patent No. 3,517,810, 4 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office Vol 875, No. 4, p. 822, June 30,1970.

Descriptors: *Patents, *Liquid wastes, *Inorganic compounds, *Activated sludge, Sewage treatment, *Aeration, *Nutrient removal, Phosphates, *Industrial wastes, *Waste water treatment, Pollu-tion abatement, Treatment facilities.

Liquid waste is treated with heterogeneous microorganisms using a first aeration step to form a mixture of the liquid treated waste and activated sludge particles in a growth aerator. The mixed liquor is settled to form an underflow of activated sludge slurry and an overflow of a second mixed liquor. The second mixed liquor overflow is aerated to form a third mixer liquor and it is settled to form an overflow of treated waste and an underflow of deactivated sludge slurry. (Sinha-OEIS)

CLARIFICATION OF WATER

Monsanto Co., St. Louis, Mo. (Assignee). M. Hedrick, and D. T. Mowry. U. S. Patent No. 3,516,932, 3 p, 21 ref; Official Gazette of the United States Patent Office Vol. 875, No. 3, p. 589, June 23, 1970.

Descriptors: *Patents, *Water purification, Suspension, *Waste water treatment, Pollution abatement, Waste treatment, Water treatment, *Flocculation, *Polymers, *Polyelectrolytes.

The clarification of water containing suspended ane cuartication of water containing suspended matter is achieved by the addition of synthetic polyelectrolytes as a settling aid. The polyelectrolytes combined with the charged particles cause rapid flocculation. (Sinha-OEIS) W72-08177

PROCESS OF TREATING ACID MINE WATER, Barnes and Tucker Co., Haverford, Pa. (Assignee). J. J. Birch.

U. S. Patent No. 3,516,931, 4 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office Vol. 875, No. 3, p. 589, June 23, 1970.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Mine wastes, *Acid mine water, Pollution abatement, Water treatment, Aeration, Flocculation, *Water pollution treat-

Acid mine water containing ferrous iron is treated by adding solid lime to the water. Limestone parti-cles are rotated about a generally horizontal axis in cies are rotated about a generally horizontal axis in an attrition mill to cause the particles to rub against one another. Fine limestone particles are added to add body to the floc which forms making the water alkaline. The floc is separated from the water by sedimentation. (Sinha-OEIS) W72-08178

METHOD OF TREATING LIQUID WASTE EF-

FLUENT, Hydro-Clear Corp., Avon Lake, Ohio. (Assignee). D. S. Ross.

U. S. Patent No. 3,516,930, 4 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office Vol. 875, No. 3, p. 589, June 23, 1970.

Descriptors: "Patents, "Liquid wastes, Waste treatment, Pollution abatement, "Filtration, "Ac-tivated carbon, "Waste water treatment, Water pollution treatment, Water treatment, Separation

A particulate filter bed is used to block the passage of large solids. Activated carbon having a particle size greater than the interstices of the filter bed is placed in the body of effluent developed above the filter bed. Currents are created adjacent to the upper surface of the filter bed to keep the adsorptive particles in suspension. Currents may be created by a diffuser for introducing carbon dioxide into the body of effluent above the filter bed. This gas tends to neutralize the effluent. (Sinha-OEIS) W72-08179

METHOD AND APPARATUS FOR BIOLOGICAL TREATMENT OF V WASTE

Passavant-Werke, (Germany) (assignee).

Passavant-weike, (Germany) assignment.
T. Wieferig.
U. S. Patent No. 3,642,615, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office
Vol. 895, No. 3, p. 1031, February 15, 1972.

Descriptors: *Patents, *Waste water treatment, *Activated sludge, *Aeration, Pollution abatement, Separation techniques, Water pollution treatment, Water pollution, Equipment, *Sludge treatment, *Biological treatment, Water purifica-

This device consists of an aerating chamber and a clarifying chamber. Waste water enters the aerating chamber where it circulates as it is aerated. A portion of the aerated liquid is led to the clarifica-tion chamber where the sludge settles to the bot-tom. The settled sludge is thereafter conveyed into the aerating chamber where it circulates in the same direction of motion of the liquid in the path same unrection in the clarifying chamber. The clarified water is removed from the top of the clarifier and the sludge is withdrawn from the aerating chamber. (Sinha-OEIS) W72-08273 TREATMENT OF SEWAGE AND OTHER CONTAMINATED LIQUIDS WITH RECOVERY OF WATER BY DISTILLATION AND OXIDATION, Anti-Pollution Systems, Inc., Pleasantville, N. J. (Assignee).

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is e pChasigners, J. Greenberg, and C. Whitaker. U. S. Patent No. 3,642,583, 5 p, 3 fig, 13 ref; Official Gazette of the United States Patent Office Vol. 895, No. 3, p. 1025, February 15, 1972.

Descriptors: "Patents, "Sewage treatment, "Distil-lation, "Oxidation, "Liquid wastes, "Waste water treatment, Pollution abatement, Water pollution treatment, Water pollution, Equipment, "Flash distillation, Organic wastes, "Heat transfer, "Evaporation, "Desalination, Textiles, Industrial wastes, Separation techniques, Water purification.

Liquid waste is introduced onto the surface of a molten salt bath which serves as a heat transfer mechanism. Flash distillation is produced and the salt acts as a catalyst in promoting efficient oxidation. The salt bath contains a chemical oxidizer which continuously releases nascent oxygen and retakes ambient oxygen. In the case in which the liquid contains only salty residues, the water is evaporated off, while the salt residue remains to function in the molten bath. Examples are given in application of this invention for treatment of textile manufacturing wastes, salt water desalination, farm wastes, and for home sewage treatment. (Sinha-OEIS) ha-OEIS) W72-08276

DEVICE FOR AERATING SEWAGE WATER, M. Danjes, and A. Schreiber. U. S. Patent No. 3,642,260, 4 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office Vol. 895, No. 3, p. 954, February 15, 1972.

Descriptors: *Patents, Sewage treatment, *Aera-tion, *Waste water treatment, Equipment, Pollu-tion abatement, Water pollution treatment, Water pollution, Waste water, Separation techniques, *Biological treatment, Water purification.

An aerating element consists of a flat elastic air tube provided with numerous air discharge ports on its upper wall. The longitudinal sides of the tube are formed as loops or pockets to receive supporting parts. One end of the tube is connected to an air supply line, the other end is sealed. The tube is ar supply line, the other end is scaled. The tube is prestressed in its flat, pressureless position by means of the supporting elements situated within the loops. As air is supplied the sides of the tube expand so that the discharge ports are opened permitting the air to enter the sewage water in the form of minute bubbles of uniform size. (Sinha-OEIS) W72-08277

APPARATUS FOR CENTRIFUGALLY REMOV-ING LIQUID FROM A MIXTURE, P. C. Wilson, and P. Hughart. U. S. Patent No. 3,642,139, 12 p, 17 fig, 14 ref; Of-ficial Gazette of the United States Patent Office Vol. 895, No. 3, p. 923, February 15, 1972.

Descriptors: *Patents, *Pulp wastes, *Centrifuga-tion, *Paper pulp wastes, Equipment, Pollution abatement, Waste treatment, *Waste water treat-ment, Water pollution treatment, Separation techniques.

A method and apparatus are described for continuously removing through a centrifuging operation, liquid from a mixture containing cellulose fiber pulp used in the paper making industry. The method involves impinging the mixture upon a rotating screen surface to form a layer of the fibrous material. The liquid passes through the screen and fibrous layer. The screen surface is cleaned by moving the edge of a transporting member over the screen; and rolling, wringing and redepositing the material on the screen and passing additional liquid through the screen. The mixture is centrifuged as a force varying between 70 and 650 times the force of gravity. The fibrous material

passing through the screen along with the liquid is recovered by impinging the mixture on the surface of a second screen. (Sinha-OEIS)
W72-08278

WASTE DISPOSAL ASSEMBLY,

A. G. Borden.
U. S. Patent No. 2,642,135, 5 p, 4 fig, 9 ref; Official-Gazette of the United States Patent Office Vol. 895, No. 3, p. 922, February 15, 1972.

Descriptors: *Patents, *Waste disposal, *Sewage treatment, *Bacteria, Biological treatment, Waste treatment, *Waste water treatment, Heat transfer, Water pollution, Water pollution treatment, Equipment, *Domestic wastes.

Sewage is introduced into a heat transfer unit where the temperature is elevated to the boiling point of water until the bacterial count is reduced to a tolerable level. (Sinha-OEIS) W72-08279

METHOD AND APPARATUS FOR TERTIARY TREATMENT OF EFFLUENT, Pollution Control, Inc., Cincinnati, Ohio. (As-

U. S. Patent No. 3,642,134, 5 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office Vol 895, No. 3, p. 921, February 15, 1972.

Descriptors: *Patents, *Tertiary treatment, Separation techniques, Pollution abatement, *Suspended solids, *Sewage effluents, Equipment, Filtration, Specific gravity, Water pollution treatment, Water pollution, *Waste water treat-

Sewage effluent from a secondary treatment plant is led into an inlet chamber of a receptacle at a predetermined rate where separation by specific gravity occurs. Effluent carrying suspended solids passes through a filter. The clear filtrate is accumulated in a clearwell chamber immediately above the filter. At the end of the filtering cycle, the filtrate backwashes the filter. The settleable solid pollutants are accumulated at the bottom of the receptacle. (Sinha-OEIS) W72-08280

FLOATING OIL CONFINING APPARATUS, Ocean Pollution Control, Inc., Dallas, Tex. (Assignee).

For primary bibliographic entry see Field 05G. W72-08281

SEWAGE TREATMENT PROCESS.

Nalco Chemical Co., Chicago, Ill. (Assignee). F. N. Kemmer, R. S. Robertson, and R. D. Mattix. U. S. Patent No. 3,640,820, 4 p, 1 fig, 4 tab, 4 ref; Official Gazette of the United States Patent Office Vol. 895, No. 2, p. 616, February 8, 1972.

*Patents, *Activated sludge, Sewage treatment, *Sewage effluent, Sewage sludge, Separation techniques, Waste treatment, *Waste water treatment, Pollution abatement.

A process of treating sewage is provided so as to form an active substance useful in removing soluble contaminants from the sewage. An activating agent from the group consisting of bicarbonate salts, carbonate salts, CO2 and CO is added to the dewatered sludge before heating. The active sub-stance is mixed into the sewage to achieve a concentration level greater than 100 ppm. The dewatered sludges are heated at temperatures rang-ing from 300 to 900 degrees C from 3 to 200 minutes at a pressure of at least one atmosphere absolute, in a controlled atmosphere. (Sinha-W72-08283

TREATMENT OF WASTE WATER FROM AL-KALINE PULPING PROCESSES, Continental Can Co., Inc., New York. (Assignee).

Continental can Co., Inc., New 1 of 1 fig., 2 ref; Official Gazette of the United States Patent Office Vol. 895, No. 1, p. 247, February 1, 1972.

Descriptors: "Patents, Pulp and paper industry, "Pulp wastes, Liquid wastes, Effluents, "Wood wastes, Pollution abatement, Separation techniques, "Waste water treatment, Waste treatment, Water pollution treatment.

A process is provided for the concomitant removal of dissolved ligneous color bodies and suspended fibrous solids from the effluent of waste waters of alkaline wood pulping processes. A water-soluble calcium salt, such as CaO or Ca (OH)2 is added at a concentration of 500 to 3300 parts of calcium salt per one million parts water to the colored waste effluent. The calcium salt is continuously contacted with the effluent waste for a period of 0.25 to about 2 hours. After separation, the aqueous phase is treated with CO2 gas for enough time to cause substantial precipitation of the dissolved calcium salts as CaCO3 and the remainder of the ligneous color bodies, the CaCO3 and ligneous color bodies forming a second solid phase. The first and second solid phases are passed to a furnace to be burned. (Sinha-OEIS) W72-08285

SEWAGE TREATMENT SYSTEM,

L. J. Peck.

U. S. Patent No. 3,638,793, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office Vol 895, No. 1, p. 150, February 1, 1972.

Descriptors: *Patents, *Sewage treatment, Filters, *Filtration, *Suspended solids, Separation techniques, Pollution abatement, Effluents, *Waste water treatment, Waste treatment, Water pollution treatment, Tertiary treatment.

Primary or secondary effluent is passed through a self cleaning mechanical strainer and then into a high-rate, granular pressure filter. A portion of the filtered effluent is recirculated through the strainer and filter to maintain a uniform flow rate on the filter. Suspended solids collected by the strainer and filter are returned for retreatment in the primary treatment area. (Sinha-OEIS) W72-08286

WASTEWATER TREATMENT SYSTEM,

W. F. Roberts, and E. L. Kaminsky. U. S. Patent No. 3,638,590, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office Vol. No 895, No. 1, p. 99, February 1, 1972.

Descriptors: "Patents, "Waste water treatment, "Coagulation, "Centrifugation, "Activated car-bon, "Disinfection, "Organic wastes, Pollution abatement, Waste treatment, Water pollution, Water pollution treatment, "Incineration.

Waste water from a collecting tank is pumped into a comminutor and then passed into a coagulating tank. The waste water and coagulated material are then introduced into a centrifuge separator. After separation of solid and liquid, the liquid is pumped into a disinfected tank. The disinfected liquid is then pumped through activated charcoal columns for purification. The solid waste is conveyed to an incinerator for burning. (Sinha-OEIS)

APPARATUS FOR CONFINING MATERIAL FLOATING ON WATER, Susquehanna Corp., Fairfax, Va. (Assignee).

For primary bibliographic entry see Field 05G.

Group 5D—Waste Treatment Processes

APPARATUS FOR SEPARATING FROM LIQUIDS AND FOR THICKENING SLUDGES,
Technische Universitaet, Berlin (West Germany).

Institut fuer Wasserbau and Wasserwirtschaft. (Assignee).

(Assignee).
J. A. W. Kaeding, and W. A. Grunert.
U. S. Patent No. 3,525,437, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office Vol 877, No 4, p 823, August 25, 1970.

Descriptors: "Patents, "Sewage treatment, Sludge, "Flotation, Water treatment, "Waste water treatment, "Aeration, Separation techniques, Pollution abatement, Water pollution, Water pollution treatment.

Water is subjected to aeration in a floatation cell. Solids which float on the surface are removed. At its inlet a resting chamber communicates with the floatation cell. The cell tapers in an upward direction in the region of its upper end. At a lower region there is an aerating device which directs small air bubbles upward and through the liquid. A discharge chamber situated at the side of the floatation cell opposite from the resting chamber is provided for discharging clear liquid from the floatation cell. (Sinha-OEIS) W72-08290

APPARATUS FOR AND METHOD OF AERAT-ING LIQUIDS,

U. S. Patent No. 3,524,629, 3 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office Vol 877, No 3, p 600, August 18, 1970.

Descriptors: *Patents, *Aeration, *Liquid wastes, *Industrial wastes, *Sewage effluents, *Waste water treatment, Pollution abatement, Water pollution treatment, Separation techniques, Equip-

A floating aerating unit includes a draft tube or eduction pipe supported on a float with its lower end beneath the surface of a body of liquid to be aerated. The upper end of the pipe is located above the surface. An inverted diffuser cone extends downward into the pipe. This enables the liquid to flow upward and radially outward into the air in a spray-like stream. (Sinha-OEIS) W72-08291

APPARATUS FOR THE TREATMENT OF SEWAGE AND LIKE INDUSTRIAL WASTE, Drysdale and Co. Ltds, Glasgow (Scotland). (As-

signee).

U. S. Patent No. 3,524,547, 3 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office Vol 877, No 3, p 580, August 18, 1970.

Descriptors: *Patents, *Sewage treatment, *Industrial wastes, *Aeration, *Waste water treatment, Waste treatment, Water pollution treatment, Pollution abatement, Separation techniques.

The treatment plant contains three compartments, a sewage-receiving compartment and two treat-ment compartments. Devices are provided in each compartment for introducing air at a point below the normal liquid level. A fluid transfer control operates in four stages; the aeration in two stages. (Sinha-OEIS)

OIL SKIMMING APPARATUS,

Ocean Pollution Control, Inc., Dallas, Tex. (As-For primary bibliographic entry see Field 05G. W72-08293

MICROWAVE IRRADIATION OF SEWAGE AND SEWAGE SLUDGE, Bechtel International Corp., San Francisco, Calif.

(Assignee).

D. J. Goerz, Jr., and B. H. Leonard, Jr. U. S. Patent No. 3,523,076, 2 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office Vol 877, No 1, p 179, August 4, 1970.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, *Waste water treatment, *Irradia-tion, Sewage sludge, *Microwaves, Water pollu-tion treatment, *Aerobic treatment, Aeration.

Sewage is subjected to primary and secondary clarification steps. Sludge solids are removed in the latter. After primary clarification of the sewage, it is treated by an aerobic biological system and is followed by the secondary clarifica-tion to produce a clear final effluent. The uniqueness of this invention consists of passing the removed solids to a concentrating stage and applying microwave energy to the solids to accelerate the settlement rate. (Sinha-OEIS) W72-08294

APPARATUS FOR THE TREATMENT OF SEWAGE AND LIKE INDUSTRIAL WASTE, Drysdale and Co. Ltds, Glasgow (Scotland). (As-

signee). I R Nicol

U. S. Patent No. 3,522,881, 2 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office Vol 877, No 1, p 135, August 4, 1970.

Descriptors: *Patents, *Sewage treatment, *Industrial wastes, *Liquid wastes, Water pollution, Water pollution treatment, Pollution abatement, Separation techniques, *Waste water treatment.

This treatment plant consists of a sewage receiving section having at least one chamber arranged to receive untreated liquid sewage. This section has an aerating device. A second section has in addition an airlift device to transfer liquid from the first to the second section. There is a special means for controlling the supply of operating air to the airlift and to the aeration device. A timing device is arranged to be set in operation by the volume-determining mechanism when the volume of liquid in the second section reaches a predeter-mined figure. (Sinha-OEIS) W72-08295

METHOD AND APPARATUS FOR CON-TROLLING OXYGEN TRANSFER AND POWER REQUIREMENTS IN A WATER AERATION SYSTEM.

Welles Products Corp., Roscoe, Ill. (Assignee). D. P. Welles, Jr.

U. S. Patent No. 3,521,864, 3 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office Vol 876, No 4, p 883, July 28, 1970.

Descriptors: *Patents, Oxygen demand, *Aeration, *Municipal wastes, *Industrial wastes, Oxygenation, Equipment, Pollution abatement, *Waste water treatment, Water treatment, Water pollution, Water pollution treatment. Identifiers: *Power requirements.

Water is drawn from beneath the surface of a body of water and is discharged on top of the surface. The propulsion mechanism is driven by a motor mounted either above or below the surface of the water. Power requirements are controlled by adding air to the water being moved by the propulsion mechanism, thereby changing its density. (Sinha-OEIS) W72-08296

CHARACTERISTICS OF WASTES FROM SOUTHWESTERN CATTLE FEEDLOTS. Texas Tech Univ., Lubbock. Water Resources

Center. For primary bibliographic entry see Field 05B. W72-08299

DESIGN AND OPERATION OF A PILOT PLANT FOR COMPOSTING POULTRY MANURE, Guelph Univ. (Ontario). Dept. of Microbiology.

R. G. Bell, and J. Pos. Transactions of the American Society of Agricul-tural Engineers, Vol 14, No 6, p 1020-1023, Nov-Dec 1971. 6 fig, 6 ref.

Descriptors: *Farm wastes, Odor, *Poultry, *Waste treatment, Runoff, Air pollution, *Pilot plants, Aeration, Operation, Design. Identifiers: *Composting.

A pilot plant for composting poultry manure is described. The composting unit consisted of a closed cylinder mounted on a steel frame, fitted with an internal rotor driven by an electric motor through a power train. Air was supplied by a fractional horsepower air compressor and was introduced into the composter through three manifold lines. Poultry manure can be composted, but the real question is whether composting reduces the pollution potential from poultry waste. The compost as discharged from the pilot plant was dark brown in color, had a nitrogen content of between 1.3 and 1.5 percent (dry wt. basis), a moisture content near 50 percent and a strong smell of ammonia. The compost did heat up which was an indication that the material was not stabilized. Even after being left unattended for several months, compost piles did not develop objectiona ble odors nor was there evidence of appreciable runoff during heavy rain storms. From these observations, it is concluded that composting does reduce the pollution potential of poultry manure and would, therefore, be a satisfactory way to treat manure prior to prolonged storage. (Bundy-Iowa State) W72-08300

CATTLE FEEDLOT WASTE PROBLEMS, Kansas State Univ., Manhattan. For primary bibliographic entry see Field 05G.

W72-08302

CHARACTERIZATION OF WASTE TREAT-MENT PROPERTIES OF PIG MANURE, Newcastle-upon-Tyne Univ. (England). Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05G. W72-08303

WASTE MANAGEMENT FOR FEEDLOTS, Nebraska Univ., Lincoln. Coll. of Agriculture. For primary bibliographic entry see Field 05G.

CLOSED SYSTEMS FOR ANIMAL SEWAGE

TREATMENT,
Massachusetts Univ., Amherst. Water Resources Research Center. J. T. Clayton.

Available from the National Technical Informa-tion Service as PB-209 215, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report FY 72-7, 1971. 11 p, 22 ref. OWRR A-009 MASS (4).

Descriptors: *Farm wastes, *Treatment facilities, Dairy industry, *Waste treatment, Sub-surface irgation, Tertiary treatment, Cattle, Solid wastes, Water reuse, *Waste disposal, Aerobic treatment.

Stationary sloping screens were used to remove up to 75% of the solids in diluted dairy cattle manure. Two bench-scale aerobic treatment systems were then used to treat screened effluent. Two replicate systems, one using distilled water and one using system final effluent to dilute incoming manure were used to determine the effects of renovated water reuse. BOD reductions greater than 95% and COD reductions greater than 90% were obtained in all systems. No adverse effects of water reuse were found. Phosphate level was not affected and there was no appreciable build-up of fecal coliform or fecal streptococcus. A one-cow scale modified activated sludge system was used to treat 120 pounds of manure and 66 gallons of dilution water daily for more than six months. The final effluent was disposed of by a sub-surface irrigation system. Plastic nozzles were found satisfactory to release the liquid to the soil. BOD and COD were further reduced by about 93% in the tertiary treatment system (soil). Best performance was obtained in the two treatments in which activated sludge effluent was periodically applied to the soil.

WASTE WATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR NASSAU AND SUFFOLK COUNTIES, NEW YORK (DRAFT ENVIRONMENTAL IMPACT STATEMENT), Environmental Protection Agency, New York.

is

Available from the National Technical Informa-tion Service as PB-204 912-D, \$3.00 in paper copy, \$0.95 in microfiche. December 10, 1971. 214 p, 9 fig, 4 map, 27 tab, 4 chart, 9 append.

Descriptors: New York, *Waste treatment, *Waste water disposal, *Environmental effects, *Treatment facilities, Sanitary engineering, Municipal wastes, Septic tanks, Solid wastes, Effuents, Groundwater, Groundwater resources, Aquifers, Groundwater recharge, Outlets, Outfall sewers, Project planning, Adoption of practices, Sewage sludge, Sewage disposal, Sewage treatment.

Identifiers: *Environmental Impact Statements, *Long Island (N.Y.), Coastal waters.

The projects involve construction of sewers, addiine projects involve construction or sewers, addi-tions and alterations to treatment plants, new treatment plants, and outfalls in Nassau and Suf-folk Counties, Long Island. The background setting is described, including: geography; popula-tion, land use, and industry; water pollution con-trol programs; federal programs; and water resources and resource management. The environresources and resource management. The environ-mental impact of four types of programs--sewer-ing, treatment plants, ocean outfalls, and effluent discharge--is analyzed. The projects will likely cause a reduction in the quantity of water in Long Island aquifers, while improving groundwater quality. Treated effluents will be discharged into the ocean. Sludge will have to be disposed of in some way. Sewage collection will alleviate pollu-tion in Suffolk County which previously has relied on septic tanks. Adverse effects which might be expected, include lowering of groundwater levels, increased saltwater encroachment, and possible increased saltwater encroachment, and possible contamination of marine areas at the site of effluent outfalls. Alternatives considered include: non-structural controls, no action, wastewater treatment methods, and alternative methods of waste disposal. The disadvantage of these alterna-tives is discussed. Long-term and short-term trade-offs are analyzed. Irreversible commitments are explained. (Grant-Florida)
W72-08335

LEAD-DEADWOOD SANITARY DISTRICT NO.
1, SOUTH DAKOTA, PROJECT NO. WPC SD200 (DRAFT ENVIRONMENTAL IMPACT STATEMENT) Environmental Protection Agency, Denver, Colo.

Available from the National Technical Informa-tion Service as PB-204 669-D, \$3.00 in paper copy, \$0.95 in microfiche. December 6, 1971. 43 p, 1 fig,

1 map, 2 tab, 4 append.

Descriptors: *Environmental effects, *Municipal Descriptors: *Environmental effects, *Municipal wastes, *Industrial wastes, *Sewage lagoons, *Water pollution control, *Pollution abatement, Sewage, Sewage disposal, Sewage treatment, Waste disposal, Waste treatment, Water quality control, Settling basins, Environmental Sanitation, Sanitary Engineering, Water pollution sources, Mine wastes, Tailrace, South Dakota. Identifiers: *Environmental Impact Statements, *Bell Fourche River (S.D.), *Cheyenne River (S.D.).

The Environmental Protection Agency is considering several alternatives to treat domestic wastes from Lead and Deadwood, South Dakota, and from Lead and Deadwood, South Dakota, and mine tailings from the adjacent Homestake Mining Company. Since each alternative will have the same basic impacts, no particular one is currently favored. The objective is to improve the environmental conditions of Whitewood Creek and the Belle Fourche and Cheyenne Rivers. Raw sewage and industrial wastes will be eliminated from these waters. A tailings profile according formulation of the second section of the second section. and industrial wastes will be eliminated from these waters. A tailings pond is essential. Groundwater contamination may result from this pond. Other adverse effects include removal of some trees, rock ledges, and other scenic items, as well as a temporary interruption of the flow of Whitewood Creek and the removal of about 600 acres of land from agricultural use. Two basic groups of alterna-tives are being considered by the Agency: (1) combined municipal and industrial waste treatment in tailings-stabilization ponds, and (2) conventional domestic waste treatment facilities with some type of separate industrial waste treatment. Comments on these alternatives have been requested. (Kohla-Florida) W72-08337

PHYSICAL-CHEMICAL TREATMENT OF A MUNICIPAL WASTEWATER USING POWDERED ACTIVATED CARBON, Envirotech Corp., Salt Lake City, Utah. Eimco Process Machinery Div. D. E. Burns, and G. L. Shell.

Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 5, No. 3, October, 4, 1971, San Francisco, California. 35 p, 7 fig, 6 tab, 18 ref, EPA Contract 14-12-585.

Descriptors: *Adsorption, *Chemical precipitation, *Filtration, *Activated carbon, Lime, *Pilot plants, Separation techniques, Operation and maintenance, Cost analysis, Design criteria, Dewatering, Odor, *Waste water treatment, *Utah,

Identifiers: Ferric chloride, Alum, *Salt Lake City, *Physical-chemical treatment.

A physical-chemical treatment (PCT) pilot plant consisting of chemical treatment of raw wastewater, carbon adsorption, and filtration in a dual water, caroni additional media gravity filter, was operated on municipal wastewater from Salt Lake City for 18 months. Chemicals tested for use in the solids contact unit included lime, alum, and ferric chloride. A single or two-stage counter-current solids contact unit, utilizing powdered activated carbon (PAC) provided soluble BOD removals. Because of the high alkalinity, and associated high lime costs, of the waste, alum was shown to be the most economical chemical for use in step 1. Cost estimates were then prepared for a 10 mgd plant producing both a moderate quality effluent (30, 32, 20, 5, 0.5, and 0.4 mg/l of total COD, soluble COD, BOD5, suspended solids, total phosphorus, and soluble total phosphorus respectively) and a high quality effluent (15, 12, 10, 5, 0.5, and 0.4 for the same parameters respectively). Cost for the high quality effluent using alum was estimated at 22.5cents/1000 gallons total treatment cost. (Lowry-Texas) W72-08353

CHEMICAL TREATMENT OF SEWAGE: EX-

PERIENCES IN SAN FRANCISCO, San Francisco City and County, Calif.

A. E. Bagot. Water and Sewage Works, Vol 118, p 295-298, September 1971, 1 fig, 3 tab.

Descriptors: *Suspended solids, *Separation techniques, Water chemistry, Colloids, Flocculation, Chemical precipitation, Sedimentation, Turbidity, Saline water, Polyelectrolytes, Laboratory tests, *Waste water treatment, *Sewage treatnent, California.

Identifiers: *Ferric chloride, *Chemical treatment,

When an immediate upgrading of the primary-type treatment offered by the City and County of San Francisco was ordered by the California Regional Water Quality Board, investigations into the use of one or more of the synthetic organic chemicals now available were started. Use of lime at the 60 now available were started. Use of lime at the 60 mgd North Point Plant was ruled out due to sludge volume, and jar tests with alum dosages up to 100 mg/l produced little or no improvement. However, jar tests with ferric chloride gave promising results, so further more intensive testing was begun with ferric chloride with and without organic polyelectrolytes. Higher levels of chloride were shown to increase the efficiency of ferric chloride, so additions of salt water to the system chloride, so additions of salt water to the system became part of the experiments. The procedure in-stituted on a plant scale included ferric chloride additions with up to 6 mgd of salt water, and additions of 0.4 mg/l of organic polymers at peak flow conditions. By these means, virtually all suspended material in the effluent was captured enabling a near zero settleable solids content to be maintained in the effluent throughout a 24-hour period. (Lowry-Texas) W72-08354

MINEWATER TREATMENT-INCO SUDBURY DISTRICT OPERATIONS, International Nickel Co. of Canada Ltd., Sudbury (Ontario). Mining and Smelting Div. W. C. Ferguson, and M. J. Morris.

Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 3, No. 3, October 4, 1971, San Francisco, California, 18 p, 10 fig, 3 ref.

Descriptors: "Mine drainage, "Heavy metals, "Leaching, Sulfides, Iron, Copper, Nickel, Acid mine waters, Suspended solids, Separation techniques, Flocculation, Sedimentation, Lime, Chemical precipitation, Filtration, Vacuum drying, Neutralization, "Waste water treatment.

The International Nickel Company's operations in the Sudbury Basin produce a combined flow of nearly 8 MGD discharged from mining operations. These waters have leached out base metal sulphides, principally those of copper, nickel, and iron. Primary treatment needs for such effluent in-clude neutralization and solids separation. Various clarification and dewatering devices have been experimented with, and the system currently being used by INco includes addition of a 1% solution of high molecular weight polyacrylamide at a rate of .0075 lbs/dry ton to aid clarification, and filtration of solids on a belt filter for dewatering. pH adjustment and dissolved solids precipitation is accom-plished through lime additions and settling in pro-tected basins. The final decision about positioning, whether at the surface or underground, has yet to be resolved. Because of the wide variety of condi-tions encountered, no standard system for all operations has been developed, but each particular aspect is being approached individually in the search for an optimum solution. (Lowry-Texas) W72-08355

CONCENTRATING FOR APPARATUS VIRUSES FROM LARGE VOLUMES, Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidermology. For primary bibliographic entry see Field 05F. W72-08356

PHOSPHATE REMOVAL FROM LAUNDRY WASTE WATER,

Rensselaer Polytechnic Inst., Troy, N.Y. Bio-En-

Rensseaer Fortycennic Inst., 1707, N. T. Bio-Environmental Engineering Div.
G. E. Galonian, and D. B. Aulenbach.
Preprint, presented at the New York Water Pollution Control Association, Winter Meeting, January 26, 1972.

Descriptors: *Phosphates, *Detergents, *Chemical precipitation, *Filtration, Calcium chloride, Iron, Aluminum, Diatomaceous earth, Laboratory

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

tests, Turbidity, Odor, Hardness (Water), Alkalinity, Hydrogen ion concentration, *Laundering, *Domestic wastes, Separation techniques, ing, *Domestic *Waste water treatment.

Both laboratory and system tests were used to establish the relative merits of alum, ferric chloride, and calcium chloride for removing orthophosphates from laundry wastewater. After precipitation of the phosphorus, a commercially available purification system, consisting of a diatomaceous earth pre-coat on tubular elements of fine wire mesh, was used to remove the phosphorus floc. Influent water contained up to 132 mg/l of phosphate, 220 mg/l (as CaCO3) of hardness, and 380 mg/l (as CaCO3) of alkalinity. Product water from the system was judged by odor, clarity, pH, total hardness, and alkalinity. Jar tests were used to determine optimum condi-tions of chemical additions and pH. For calcium chloride, a molar ratio of CaCl2: PO4 of 2.0 at pH 10.0 was optimum, and it produced a 3.0 mg/1 PO4 minimum. Phosphate removal by aluminum or iron addition requires A1: PO4 and FeP)O4 molar ratios of 1.5-2.0, and optimum pH's of 5.5 and 5.0-6.0 for aluminum and iron respectively. It was also demonstrated that phosphate removals were compatible with simultaneous removal of detergents by cationic detergent additions. A high clarity water with some BOD removal was produced by all systems, which could be further processed for possible re-use. (Lowry-Texas) W72-08358

MANFORCE, A PROGRAM OF THE WATER POLLUTION CONTROL FEDERATION, Water Pollution Control Federation, Washington,

D.C. J. A. Voegtle.

Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 8, No. 1, October, 5, 1971, San Francisco, Califor-

Descriptors: *Water Pollution Control Federation, *Personnel, *Training, Operation and maintenance, Administration, Management, Trade associations, Waste water treatment.
Identifiers: *MANFORCE, *Treatment plant operators, Certification, Job classification.

The wide variety of qualifications and classifications for wastewater and water treatment plant operators has prevented the exchange of much operators has prevented the exchange of much valuable information, and made reciprocity of operator's credentials an impossibility. To eliminate this problem, the MANFORCE (Manpower For A Cleaner Environment) program was initiated by the Water Pollution Control Federation. The creat for this property of the control of t tion. The areas to which the program will be specifically applied are: (1) intensified efforts at getting Deeds and Data into the hands of all appropriately concerned operations and maintenance personnel; (2) the production and maintenance of a Catalog of Training Resources; (3) the classification of jobs in wastewater treatment facilities; (4) a review of operator program improvements which both have been and need to be made; (5) development of training modules; and (6) a Compendium of Certification Examinations. Potential revenue sources include state and federal grants, private foundations, WPCF member association participa-tion, and revenues from MANFORCE projects. By pooling the collective resources of the member associations into the MANFORCE project, much greater progress can be made than will be possible if the individual organizations continue to work independently. (Lowry-Texas) W72-08360

EQUITABLE SHARING OF MUNICIPAL WASTE TREATMENT COSTS-TECHNICAL CONSIDERATIONS,

Chrysler Corp., Detroit, Mich. For primary bibliographic entry see Field 05G.

EAST BAY MUD IS KNEE-DEEP IN PLANS.

Water and Sewage Works, Vol. 118, p 304-306, September 1971, 4 fig.

Descriptors: *Sewage treatment, *Planning, *Administration, Estimated costs, Financing, Bond issues, Legislation, Sludge, Vacuum drying, Filtra-tion, Color, Water reuse, Pilot plants, *Waste water treatment, *Treatment facilities, *Califor-Identifiers: *San Francisco.

The East Bay Municipal Utility District currently serves eight communities on the Eastern shore of San Francisco Bay with a combined population of 618,000. Primary treatment is currently provided for municipal wastes before discharge to the for municipal wastes before discharge to the ocean, but a \$60 million renovation is planned to meet new federal and state government regulations by providing secondary treatment for all wastes. After an extensive public relations campaign the bond issue for the required money passed on a 70% majority of the voting public. The new system will include vacuum filtration and lendfill discoul of circums who have the memories the landfill disposal of primary sludge, removing the landful disposal of primary sludge, removing the sludge particles from discharge to the water. Several approaches to removal of dissolved and suspended organics are being investigated, with the final selection not yet made. A pilot scale reclamation experiment for wastewater re-use in industry at a rate of 2 mgd is also planned. EBMUD has also requested legislation enabling them to restect their raw investment by results. them to protect their new investments by regulating materials to be discharged, and excellent progress was being made towards the passage of this legislation at press time. (Lowry-Texas)

DESIGN AND OPERATION OF A COMBINED CARBON OXIDATION-NITRIFICATION AC-TIVATED SLUDGE PLANT,

Consoer, Townsend and Associates, Chicago, Ill. W. J. Beckman, R. J. Avendt, T. J. Mulligan, and G. J. Kehrberger.

O.J. Kenroerger.

Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 16, No. 3, October, 6, 1971, San Francisco, California, 50 p, 17 fig, 5 tab, 9 ref.

Descriptors: "Nitrification, "Activated sludge, "On-site investigations, Laboratory tests, Design criteria, Temperature, Dissolved oxygen, Hydrogen ion concentration, Toxicity, Inhibition, Ammonia, Tertiary treatment, Water pollution control, "Waste water treatment, "Michigan, "Operative Option Laboratory and Control of the Control of *Operations, Optimal development plans. Identifiers: Sludge age, *Flint (Mich), *Optimal operations

The combination of biological oxidation-nitrifica-tion has been investigated on both laboratory and full scale equipment. Nitrification was incor-porated into a step-aeration activated sludge plant design without necessitating separate aeration tanks, final clarifiers and sludge masses. Optimal operating conditions included: (1) a temperature of 65 degree F; (2) food-to-microorganism ratios of 0.25; and (3) sludge ages greater than 6 days. Dur-ing operation at these optimal conditions, a well nitrified effluent with 95% reductions in BOD and suspended solids was produced. Laboratory stu-dies were also conducted to determine the effects were also conducted to determine the effects of heavy metal toxicity on the nitrification process. Dissolved oxygen concentrations greater than 2.0 mg/1 also inhibited nitrification if a sludge blanket was not allowed to form. Full scale plant investigations continue in attempts to substantiate the optimal parameters already produced, and to provide further design information. (Lowry-Tex-W72-08363

EFFECT OF ACRYLONITRILE ON ANAEROBIC DIGESTION OF DOMESTIC SLUDGE, Idaho Univ., Moscow J. C. Lank, Jr.

Master's Thesis, March 1970, 63 p, 13 fig, 9 tab, 48

Descriptors: "Textiles, "Industrial wastes, "Anaerobic digestion, "Toxicity, Sludge, Laboratory tests, Organic loading, Hydrogen ion concentration, "Waste water treatment, "Sludge treatment,"

Identifiers: *Acrylonitrile, Gas production, *Digester gas composition, Volatile acids.

Previous work has established that acrylonitrile, a Previous work has established that acrylonitrile, a basic monomer for the production of many synthetic fibers, is readily treated by aerobic biological processes. To establish the effect of acrylonitrile on anaerobic digestion, two digesters were operated in parallel with identical raw sludge loadings, and measured amounts of acrylonitrile were added to one digester while the other served are a control. As the acrylonitrile level was existed. as a control. As the acrylonitrile level was raised periodically throughout the study, volatile solids, chemical oxygen demand reduction, volatile acid concentrations, and gas production and composi-tion data were taken and compared for the two digesters. Results indicated that sludges of up to 10 mg/1 acrylonitrile can be successfully digested anaerobically. Additional study is required to establish a precise toxic limit, however, the demonstration that the toxic limit is above 10 mg/1 and friend from the toxic limit is above 10 mg/1. is of significant value, since all previous work had indicated that sludge containing acrylonitrile in any amount was not amenable to anaerobic digestion. (Lowry-Texas)

HEALTH FACTORS IN THE RE-USE OF WASTE WATER FOR AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL PURPOSES, Hebrew Univ., Jerusalem (Israel). Environmental

H. I. Shuval. Problems in Community Wastes Management, World Health Organization-Public Health Papers 38, 1969, p 76-89, 1 tab, 35 ref.

Descriptors: *Water reuse, *Public health, Irriga-tion water, Industrial water, Potable water, Toxicity, Chemical wastes, Detergents, Pathogenic bacteria, Artificial recharge, Separation techniques, Aesthetics, Waste water treatment.

As fresh potable water supplies continue to dwin dle, re-use of treated waste-water for industrial and agricultural purposes may become more economical than importation of water over long distances. Potential problems in agriculture which must be overcome before wastewater re-use becomes widespread center mainly around con-tamination of food, food handling equipment, and food industry personnel. Management must be sure that only those crops which must be cooked sure that only those crops which must be cooked before consumption receive irrigation by waste-water, and handling methods must be updated to prevent equipment contamination. Industrial utilization is far less restricted than agricultural, although care must be exercised to avoid cross connections with potable water lines. Possibilities for limited municipal use include for toilet flush-ing fire fighting irrigation of parks, excless and ing, fire fighting, irrigation of parks, gardens, golf courses, and for street cleaning. Again, the greatest risk would arise from possible cross con-nections. Some recycle of treated wastewater as potable water is currently proceeding, and in these and all other programs for water utilization, physi-cal, microbiological, and chemical pollution in relation to the public health must determine limits on the use of reclaimed water which must not be exceeded. (Lowry-Texas) W72-08365

SETTLERS THROUGHPUT.
Environmental Science and Technology, Vol 6, No. 4, April 1972, p 312-313, 2 fig.

Descriptors: *Separation techniques, *Coagula-tion, *Sedimentation, Tubes, Reynolds number, Velocity, Laminar flow, Turbulent flow, Sludge, Performance, Municipal wastes, Industrial wastes, Design criteria, *Waste water treatment, Water treatment.
Identifiers: *Tube settlers, *Clarification.

Tube settlers consist of banks of tubes inclined at an angle through which solids-laden effluents flow from bottom to top. While flowing through the tubes, solids settle out on the lower wall and slide back down the tube to a sludge collector while clarified effluent flows out the top. Tubes should have minimal height, uniform settling distance, and the tube shape must permit efficient nesting. The shape must also provide for laminar flow in the range of operational flow rates. A chevron shaped tube, developed by Permutit Corporation, consists of an array of 24 in. long tubes in a 1 inch chevron configuration. Tube height is less than tube width and settling distance is uniform, while the v-groove promotes optimum sludge compactube width and settling distance is uniform, while the v-groove promotes optimum sludge compaction and flow as well. Further extensive field testing results are being awaited before a major promotional campaign is initiated by the industries involved. However, since preliminary results indicate that well designed tube settlers can operate at 4-5 gpm/sq ft in the same space as a 1.0-1.5 gpm/sq ft conventional clarifier, tube settlers have a promising future if operational problems can be kept to a minimum. (Lowry-Texas) W72-08366

KINETIC STUDIES OF DENITRIFICATION BY PSEUDOMONAS DENITRIFICANS, Washington Univ., Seattle.

Won Hong Lee.
Master's Thesis, August 1971, 63 p, 7 fig, 6 tab, 77

Descriptors: *Kinetics, *Denitrification, *Laboratory tests, Nitrogen cycle, Nitrification, Instrumentation, Manometers, Pressure, Solubility, Temperature, Mixing, Inhibition, Anaerobic conditions, *Waste water treatment. Identifiers: Reaction rates, *Pseudomonas denitrificans.

Laboratory scale tests were performed on organisms grown in batch reactors to obtain data on the kinetics of denitrification by Pseudomonas denitrificans. Use of a manometer allowed the pressure changes caused by the nitrification to be measured, after correction for atmospheric pres-sure variations. Sodium acetate was used as substrate, and the amount of N2 gas liberated from each substrate concentration was measured and plotted N2 produced versus sodium nitrate produced per hour. The rate of denitrification was demonstrated to follow the Michaelis pattern, not being inhibited by high substrate concentration. (Lowry-Texas) W72-08367

PILOT PLANT STUDIES OF FLOCCULATION, Technion - Israel Inst. of Tech., Haifa (Israel). Y. A. Argaman.

Journal of the American Water Works Associa-tion, Vol 63, No. 12, p 775-777, December 1971, 5 fig. 1 tab. 9 ref.

Descriptors: *Flocculation, *Prototype tests, *Mathematical models, Turbidity, Performance, Hydrolysis, Chemical precipitation, Adsorption, Separation techniques, Mixing, *Pilot plants, Water treatment, *Waste water treatment. Identifiers: Aggregation, Break-up.

The theoretical results of a recent study of floccu-lation kinetics of turbulent fluids have been aplation kinetics of turbulent fluids have been applied, along with pilot plant testing of flocculators, to the design of flocculation reactors. The pilot scale experiments demonstrated the validity of the general theory, as well as provided the constants to be used in the theoretical prediction equation. Actual performance data from a prototype floccu-lator were in good agreement with results pre-dicted from pilot plant studies. (Lowry-Texas) W72-08368

RACETRACK SEWAGE PLANT SOLVES DIM-MITT'S SANITATION PROBLEMS,

J. Ehly. Water and Sewage Works, Vol 118, p 302-303, Descriptors: *Aerated lagoons, *Waste water treatment, *Operation and maintenance, Electric power costs, Aeration, Rotors, Sedimentation, Irrigation, Water reuse, Fertilizers, *Texas, *Oxidation lagoons.
Identifiers: *Clarification, *Solids recycle, *Dim-

A circular 100 ft. wide and 300 ft. long oxidation ditch has replaced outdated and odor producing waste treatment facilities at Dimmitt, Texas. Horizontal rotors provide both the aeration and velocity of the wastewater. Power for the system is provided by 4 motors, one 2.1 Hp motor and three 3/4 Hp motors. Maintenance consists of routing greating and cleaning and electric cover. tine greasing and cleaning, and electric power costs average \$350/mon. Ditch effluent is piped to a clarifier, from which solids are rec cled up to a certain level, and the remainder is sold as fertilcertain level, and the remainder is some as settinger. The effluent is currently available at no charge for agricultural irrigation. Many future possible uses for the effluent, such as industrial reuse, and park use, are envisioned by the community leaders. (Lowry-Texas) W72-08369

REMOVAL OF ORGANICS FROM WATER BY SYNTHETIC RESINOUS ADSORBENTS, Diamond Shamrock Chemical Co., Redwood City,

Calif. I. M. Abrams.

Chemical Engineering Progress Symposium Series, No. 97, Vol 65, p 106-112, 1969, 7 fig, 2 tab, 29 ref.

*Separation techniques. Descriptors: Descriptors: "Separation techniques, "ton exchange, "Adsorption, "Resins, Activated car-bon, Phenols, Iron, Performance, Color, Colloids, Cost analysis, "Waste water treatment. Identifiers: "Synthetic resinous adsorbents.

Both granular activated carbon and synthetic condensate ion exchange resins are used to separate various molecules or ions from aqueous solution. Successive treatment with diatomite filtration and resin adsorption on river water has indicated that satisfactory color removal can be achieved at material costs ranging from 3 cents to 4 cents/1000 gallons. Tests have also been conducted to detergations. I ests nave also been conducted to deter-mine the ability of adsorption resins to remove or-ganics when in the presence of iron. An influent containing 5.6 mg/l of iron for each 20 mg of humic acid resulted in a three to seven-fold increase in the capacity of the resins to remove organics. Synthetic resins have also been tested as to their ability to remove refractory organics found in the effluents of biological treatment systems. A phenolic condensate resin with low tertiary amin activity achieved complete color removal, 65% ultraviolet absorbance reduction, and 50% COD traviolet absorbance reduction, and 50% COD removal. Cost estimates for a 1 mgd plant operated at 2.5 gal/min/cu ft were \$128,000 for capital costs and 8.5 to 16.5 cents/1000 gallons for operating costs. Other possible uses include water deionization, wastewater reclamation, municipal water supplies, and small replaceable cartridge filters. (Lowry-Texas) W72-08371

COST OF INDUSTRIAL AND MUNICIPAL WASTE TREATMENT IN THE MAUMEE RIVER BASIN, Enjay Chemical Co., Baytown, Tex. For primary bibliographic entry see Field 05G.

TREATMENT OF WASTE CONTAINING NTA IN A TRICKLING FILTER PLANT, Iowa State Univ., Ames.

D. W. Hubly. Master's Thesis, 1971, 141 p, 17 fig, 21 tab, 27 ref.

Descriptors: *Detergents, *Nitrilotriacetic acid, *Chemical wastes, *Trickling filters, *Pilot plants, Performance, Nitrification, Monitoring, Surfactants, Phosphates, *Waste water treatment. Identifiers: *Acclimatization.

A 3 gpm pilot-scale trickling filter was operated on primary domestic effluent to which sodium nitrilotriacetate (NTA) had been added in the amounts of 4,8, and 16 mg/l. Influent, effluent, and background NTA levels were measured by the zinc-zincon method, and filter performance was monitored by analysis of BOD, COD, TOC, SOC, suspended solids, ammonia nitrogen, organic nitrogen, nitrate nitrogen, and phosphate in composite samples of influent and effluent. None of the NTA levels studied produced any adverse effects on either trickling filter performance, (as measured by BOD, COD, TOC removal efficiency) or nitrification efficiency. A two to three week acclimation period was required at a feed level of 4 mg/l NTA before complete NTA removal was achieved. After acclimation NTA levels of less than 0.5 mg/l, for the 4 and 8 mg/l dosages, and 1.0 mg/l, for the 16 mg/l dosage level, were achieved. After initial acclimation, subsequent changes in dosage level were adjusted quite rapidly. (Lowry-Texas)
W72-08373

TREATMENT OF LAUNDROMAT WASTES - PART I WINFAIR WATER RECLAMATION SYSTEM,

SYSTEM, Rensselaer Polytechnic Inst., Troy, N.Y. D. B. Aulenbach, P. C. Town, and M. Chilson. Proceedings, Industrial Waste Conference, 25th, May 6, 1970, p 36-53, 8 fig, 10 tab, 8 ref.

Descriptors: *Laundering, *Phosphates, *Separa-tion techniques, *Coagulation, Chemical precipita-tion, Sedimentation, *Floculation, *Filtration, Adsorption, Activated carbon, Ion exchange, Neutralization, *Chlorination, Biochemical ox-ygen demand, Chemical oxygen demand, Opera-tion and maintenance, Hydrogen ion concentra-tion, Fouling, Water reuse, *Waste water treat-ment

Identifiers: *Combined treatment.

The Winfair Water Reclamation System incorporates alum coagulation-flocculation, pH adjust-ment, sedimentation, pressure filtration, anion exchange, carbon adsorption, chlorination, neutralization, and recycling of treated effluent. Alum added to achieve a pH of 4-5 resulted in an effluent containing an average of 11 mg/l ABS, twice the level recommended for the detergent twice the level recommended for the detergent removal ion exchange resin. BOD and COD reductions were 61 and 71% respectively, while ABS removals averaged 94%, with a 2.3 mg/l residual. However, the demineralizer system was non-functional, resulting in a build up of total solids. If the water was not to be reused, however, the demineralizer would not be needed. Satisfactory effluent reuse with this system could not be achieved. However, the effluent produced was of sufficiently high quality to allow direct discharge to many streams, and certainly satisfactory for discharge to a subsurface disposal system. (Low-ry-Texas) ry-Texas) W72-08375

BIOCHEMICAL ENGINEERING ASPECTS OF THE ACTIVATED-SLUDGE PROCESS, Simon-Hartley Ltd. (England).

C. D. Furness

Water Pollution Control, Vol 70, 1971, p 528-532, 2

Descriptors: "Activated sludge, "Aeration, Organic loading, Toxicity, "Waste water treatment. Identifiers: "Reactor configuration, "Plug flow, "Complete mixing, Sludge bulking, Sludge settling characteristics, Shock loading resistance.

A detailed study was performed to evaluate the reaction kinetics of the activated sludge process, with particular attention being paid to the shape of the reaction vessel. Laboratory scale plug flow and completely mixed reactors were compared on the basis of: (1) consistency of chemical composition; (2) resistance to shock loadings; (3) resistance to toxic effects; (4) ammonia assimilation; and (5) resistance to oxygen transfer. Based only

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

on these criteria, the completely mixed reactor is the obvious choice, but the question of sludge separation must also be accounted for. Recent investigations have indicated that uninterrupted supplies of carbohydrate material to activated sludge organisms will cause bulking of the sludge. Therefore, the recommended reactor configuration includes an initial completely mixed stage consisting of up to 50% of the total aeration volume, followed by at least two plug flow units in series. Such a configuration will both provide the shock and toxicity resistance of complete mixing and at the same time ensure discontinuity of supply of readily degradable compounds. (Lowry-Texas) W72-08378

CALCIUM PHOSPHATE PRECIPITATION AT SLIGHTLY ALKALINE PH VALUES, Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering. J. F. Ferguson, D. Jenkins, and J. Eastman. Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 5, No. 2, October 4, 1971, San Francisco, California. 27 p, 10 fig, 1 tab, 13 ref.

Descriptors: *Phosphates, *Chemical precipita-tion, *Separation techniques, Calcium, Alkalinity, Hardness (Water), Magnesium, Activated sludge, Hydrogen ion concentration, Laboratory tests, Cost analysis, *Waste water treatment, *Calcium compounds.

Identifiers: *Calcium phosphate.

Both batch and continuous flow laboratory scale studies of the kinetics of calcium phosphate precipitation were conducted. Evaluation of the effects of pH and bicarbonate concentration on phosphate precipitation from a synthetic wastewater produced results that were in close agreement to those predicted through use of the empirical rate equation. The process was found characteristically to have an induction period followed by crystal growth. Phosphate removal during crystal growth indicated that the precipitation reaction was limited by a reaction at the interface between liquid and solid. Predictions and limited experimental data demonstrated that calcium phosphate precipitation at pH 8.0 can effectively remove 85-90% of the phosphate from wastewaters in a solids recycling reactor. The low calcium phosphate precipitation reaction is feasible for use in combination with activated sludge treatment if: (1) alkalinity and magnesium concentrations are less than 350 mg/l as CaCO3 and 24 mg/l as Mg respectively; (2) solids recycle is rapid enough that low by H does not develop, causing the redissolution of the precipitate; and (3) pH is between 7.5 and 8.5. Cost of the process was estimated at \$5 to \$7/milion gallons for a low alkalinity, low hardness water, as compared to \$20 to \$50/million gallons for addition of alum or iron salts to the activated sludge. (Lowry-Texas) W72-08379

FATE OF LIGNIN IN ACTIVATED SLUDGE TREATMENT OF KRAFT EFFLUENTS, Toronto Univ. (Ontario). Dept. of Civil Engineer-

ing. J. Ganczarczyk. Publication No. 72-02, May 1972, 20 p, 1 fig, 6 tab,

Descriptors: *Pulp wastes, *Lignins, *Color, *Ac-Descriptors: "Pulp Wastes, "Lignins, "Color, "Activated sludge, Eduge, Aldoge, Adsorption, Chemical precipitation, Organic loading, Hydrogen ion concentration, Enzymes, Sulfite liquors, Chlorination, Pulp and paper industry, "Waste water treatment, "Acration, "Biological treatment, "Laborators tests" tory tests.

Laboratory scale studies on the aeration of simu-lated unbleached kraft mill liquor in the absence of biological growth, as well as laboratory experi-ments on activated sludge treatment of other pulp mill wastes, were conducted in order to more clearly delineate the mechanism by which lignin

and lignin compounds are removed during biological treatment. Simple aeration of kraft black liquor in the absence of biological growth, resulted in precipitation of some organics and a decrease in pH, color, and nitrosulignin reaction. Similar effects were noted with Indulin ATR solutions, and oxidative condensation of lignin molecules oxhatave contensation of ignin molecules was suggested as a possible explanation of these phenomena. Another possible explanation included stimulation of lignin molecules by the enzymes of biological growth, with the growth then able to adsorb the condensated lignin molecules for disposal with the waste sludge. Methoxyl contensation of the condensated lignin molecules are contensated lignin molecules. tent studies in various activated sludges receiving pulp mill wastes also implied that some selective transformation of lignin material occurs during activated sludge treatment, but no single well-defined pathway was demonstrated. (Lowry-Texas) W72-08380

THE ELIMINATION OF ODOUR FROM THE EFFLUENT GASES OF CHICKEN MANURE DRYING PLANT,

Loughborough Univ. of Technology (Ontario). A. S. Hodgson.

Journal Agriculture Engineering Research, Vol. 16, No. 4, p 387-393, December 1971, 3 fig, 1 ref.

Descriptors: *Farm wastes, *Poultry, *Odor, Dehydration, *Drying, Feed, *Waste treatment. Identifiers: Pilot experiment, Waste gas, Scrubber, Cyclone separator,

Practical means of reducing odor from a chicken manure drying plant waste gas stream were in-vestigated. The cause of the odor and possible means of removal from the waste gas were stu-died. Although odor removal was possible, the cost is high. The problem should be considered during the plant design stage. A chicken manure drying plant must be designed initially with the problem of effluent gas odor of primary importance. For the plant studied, operation was consistent with the operating manual. Recycle rates were lower than expected which may increase the odor problem. The odor in the gas stream from the chicken manure plant is caused by ammonium salts of carboxylic acids, free acids and neutral material and possibly other material. The drying of chicken manure must be accomplished in a system which does not produce gaseous effluent with strong odor. The ultimate result of not considering the odor problem at the initial design stage is to risk having the plant shut down as a public nuisance. A closed system is probably the only satisfactory method for overcoming this problem. Modifications to a plant for odor removal are difficult and expensive. (Bundy-Iowa State) W72-08386

CONTROL OF POULTRY HOUSE VENTILA-TION SYSTEMS USING SOLID-STATE CON-TROLS.

Agricultural Research Service, State College, Miss. Farm Electrification Research Branch. F. N. Reece, and J. W. Deaton.

Transactions of the American Society of Agricultural Engineers, Vol. 14, No. 6, p 1073-1075, November-December, 1971, 3 fig, 2 tab, 7 ref.

Descriptors: *Confinement pens, *Ventilation, *Poultry, Temperature, Cooling, *Waste treatment. Identifiers: *Solid-state controls, Humidity controller, Variable-speed d-c motor.

Chickens, because of size, growth characteristics and sensitivity to light, lend readily to manipula-tion of production efficiency through confinement housing. However, as with any livestock, the suchousing. However, as with any livestock, the suc-cess of confinement housing is dependent largely on the ventilation system. The conventional poultry-house ventilation system generally uses multiple fans, usually low-pressure axial-flow type, controlled by time clocks and thermostats, to regulate ventilation rate and control house tem-

perature and humidity. The application of solidperature and humidity. The application of solid-state voltage control devices, used to control the speed of permanent split-capacitor, fractional-hor-sepower motors, further refines the system by providing resolution of the incremental steps of the multiple-fan system. The application of varia-ble-speed, 1-hp and larger, d-c, electric motors with solid-state control to poultry-house ventila-tion systems appears to offer a method of solving some of the current problems in ventilation systems. By using a variable-speed, d-c motor and an appropriate, solid-state power controller regu-lated manually in summer and by means of dry-bulb or dew-point temperature transducers in bulb or dew-point temperature transducers in winter, ventilation rate can be controlled in windowless poultry houses over the entire range necessary for optimum conditions throughout the year. The system provides a method of reducing the complexity of design and operation of ventila-tion systems. (Bundy-Iowa State) W72-08387

ROTOR AERATION OF SWINE WASTES, Illinois Univ., Urbana. Dept. of Agricultural En-

D. L. Day, J. C. Converse, and D. D. Jones. Illinois Research, University of Illinois Agricul-tural Experiment Station, p 16-17, Spring, 1968, 4

Descriptors: *Farm wastes, *Oxidation, Aeration, Hogs, Gases, Odors, Confinement pens, Ammonia, *Waste water treatment, Costs, Waste treatment. Identifiers: *Oxidation ditch, Foaming, Rotor

Laboratory tests on aeration of hog wastes in-dicated that it might be feasible to develop an oxidation ditch in a confinement swine house. With this method, self-cleaning slotted floors could be used without objectionable gases and odors coming from the gutter. Eighty pigs averaging 120 pounds were used. The gutter was filled with tap water, and 100 gallons of activated sludge from the Urbana waste-treatment plant was added as an inoculum at the beginning of the test. The major problem was foaming which began during the fifth week of operation. On the basis of an electricity rate of 2 cents per kilowatt hour, the power to furnish the proper oxygen supply costs about a half a cent per pig per day. During the second test, a rotor with a 3/4-horsepower motor was used to supply 0.9 pounds of oxygen per pig per day. Foaming was not as serious as during the first test. On the second test, an ammonia odor was very evident in the building, and appeared to be coming from the aerated waste. This odor subsided, however, during the ninth week and did not recur. Be-fore the oxidation ditch can be unconditionally recommended for swine confinement buildings, several problems must be solved. The most im-mediate of these is the control of foaming. (Bundy-Iowa State) W72-08388

DISPOSAL OF LIQUID WASTES FROM PAR-LORS AND MILKHOUSES, Pennsylvania Agricultural Experiment Station, University Park. N. H. Wooding. Special Circular 154 (1971), 12 p, 2 tab.

Descriptors: *Farm wastes, *Aerobic treatment, *Sprinkler irrigation, Solid wastes, Effluents, Treatment facilities, Lagoons, Milk, Irrigation systems, Permits, Pennsylvania, Legislation, Sep-*Waste water treatment, *Waste water disposal. Identifiers: *Dairy cattle, Milking parlor wastes, Pennsylvania Clean Streams Law.

The problem of disposing of liquid wastes from dairy operations is becoming increasingly impor-tant in the light of current legislation. The Pennsylvania Clean Streams Law and its effect upon this disposal are discussed. The Clean Streams Law

requires a waste water disposal permit for any facility that will discharge into surface or underground waters, create a danger of polluting these waters, or may be necessary for effective regulation of the facility even though it does not have a direct discharge. One of the major problems of a dairy operation is the disposal of milking parlor liquid wastes. One method of treatment is the use of aerobic lagoons, anaerobic lagoons being unacceptable due to the production of odors. Solid wastes and milk should be excluded to prevent overloading the system. The wastewater from the lagoon can be disposed of with a sprinkler-irrigation system. (Dorland-lowa with a sprinkler-irrigation system. (Dorland-Iowa W72-08393

LAGOONING OF LIVESTOCK WASTES IN

SOUTH DAKOTA, South Dakota State Univ., Brookings. Dept. of

J. N. Dornbush, and J. R. Andersen.
In: Proceedings, Industrial Waste Conference, 19th, 1964, Part 1, p 317-325, 2 fig, 2 tab, 8 ref.

Descriptors: *Farm wastes, *Lagoons, Anaerobic conditions, Aerobic conditions, Poultry, Biochemical oxygen demand, Chemical oxygen demand, Ammonia, Nitrogen, *South Dakota, Waste water treatment. Identifiers: *Dry solids, Volatile solids, Cages.

Current studies of lagoons in South Dakota have elucidated some of the basic factors influencing the design and operation of farm manure lagoons in a northern climate. To serve as an economical final method of disposal of farm manures, the lagoons must maintain anaerobic biological action and should be loaded on a volatile solids (VS) basis as are other sludge digesters. A loading rate of five to 10 lbs of VS per 1,000 cu. ft. of lagoon volume has been found satisfactory where winter condi-tions result in storage of manures for prolonged periods. Mixing the lagoon contents to disperse sludge deposits appears essential to avoid offen-sive odors. An adequate water depth to facilitate mixing is desirable and lagoon depths of five to eight ft. warrant consideration. (Bundy-Iowa State) W72-08395

RECYCLING SYSTEM FOR POULTRY

WASTES, Lake Tahoe Area Council, Tahoe City, Calif. G. L. Dugan, C. G. Golueke, and W. J. Oswald. Journal Water Pollution Control Federation, Vol. 44, No. 3 p 432-440, March 1972, 3 fig, 2 tab, 9 ref. EPA Grant 5R01 U100566-03.

Descriptors: *Farm wastes, Poultry, Nitrogen, Lagoons, Pumping, Aerobic treatment, Biochemi-cal oxygen demand, Chemical oxygen demand, Nutrients, *Waste treatment, *Algae, Costs. Identifiers: *Oxidation ditch, Hydraulic manure handling.

An integrated waste management system was developed in which animal enclosure sanitation was integrated with waste treatment. It was a larwas integrated with waste treatment. It was a largely closed hydraulic system involving an anaerobic phase and an aerobic phase in which oxygenation could be accomplished either by the photosynthetic activity of algae or by mechanical aeration. When photosynthetic oxygenation was used, algae were harvested. The range of application of the process is from small-scale to large-scale operations. Algae reclamation would be executed in large-scale operations and induced scate operations. Algae reclamation would be practiced in large-scale operations and induced aeration in smaller ones. An important operational feature of the system is to keep the solids content of the manure slurry to less than 3 percent, wet weight. At concentrations of 3 percent or less, 70 percent or more of suspended solids in manure slurries settle out of suspension in less than 30 min. Pond depth should not exceed 12 in. (30.5 cm). The indicated pond area per bird was 2 so. ft. cm). The indicated pond area per bird was 2 sq. ft. (0.19 sq. m.). An economic evaluation based on an

integrated system of 100,000 egg layers and the application of the low-loading, high-cost, and over-designed components used in the research indicates that the waste-handling costs of the system would be at the most, \$0.02/dozen eggs. If the value of the algal crop were credited to the opera-tion, the net waste-handling cost would be about \$0.01/dozen eggs. (Bundy-Iowa State) W72-08396

ALTERNATIVES IN CATTLE FEEDLOT WASTE MANAGEMENT,

Iowa Univ., Iowa City. Dept. of Civil Engineering. R. R. Dague. In: Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University, Engineering Extension Series No. 137, Part 1, p 258-265, 1 fig, 17 ref.

Descriptors: *Farm wastes, *Waste treatment, *Design criteria, Runoff, Waste water disposal, Waste water treatment, Waste disposal, Physical properties, Chemical properties, Biological properties, Control systems, Economic feasibility, By-products, *Feed lots, Cattle.

Identifiers: Population equivalents, Pollution sectestical.

potential.

In the 32 leading cattle-feeding states there are about 200,000 cattle feedlots. In 1967, the 22 million cattle produced in these feedlots produced about 200 million lb/day (dry weight) of manure. The control practices employed in a given region or state may be necessary and effective in that area but be unnecessary or ineffective in another area. The form of the wastes as they enter the environment may bear only a slight resemblance to what they are like when fresh. The manure accu-mulation on the feedlot surface is one waste--the runoff is another. The expression of animal waste quantities in terms of human population equivalents is very misleading, the important fac-tor is the amount and characteristics of the material that actually enters the stream. The steps that should be involved in solving feedlot waste problems are: (1) Can the waste volume and/or problems are: (1) Can the waste volume and/or strength be reduced at the source. (2) Can the physical, chemical, and biological characteristics of the waste be improved at the source. (3) Is possible and feasible to recover by-products from the waste. (4) What systems will most economically accomplish the necessary degree of waste control or treatment. Management of the manure and the runoff are discussed. (Dorland-Iowa State) W72.08397 W72-08397

REDUCTION OF NITROGEN CONCENTRA-TIONS IN SWINE LAGOON EFFLUENT BY BIOLOGICAL DENITRIFICATION, Iowa State Univ., Ames. Dept. of Agricultural En-

gineering. J. K. Koelliker, and J. R. Miner.

In: Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University, Engineering Extension Series No. 137, Part 1, p 472-480, 6 tab, 11 ref. PHS Grant EC 00283-02.

Descriptors: *Farm wastes, *Denitrification, *Biological treatment, Hogs, Liquid wastes, Effluents, Nitrogen, Anaerobic conditions, Irrigation, Lagoons, Aerobic conditions, Oxidation-reduction potential, *Waste treatment, Waste disposal disposal.

Identifiers: Carbon source, Anaerobic lagoons.

Conventional schemes that treat liquid animal wastes are designed to reduce organic material and to reduce solids volume before final disposal. Removal of nitrogen by such operations is in-cidental. If such lagoon effluent were released into the environment, problems would arise from the quantities of nitrogen remaining. Because of these problems, or potential problems, with irrigation disposal of anaerobic swine lagoon effluent, a study was undertaken to explore the feasibility of reducing nitrogen concentrations before disposing of the effluent. Reduction of nitrogen concentration by biological denitrification is discussed. The conditions necessary for denitrification are a source of NO3-N, an available organic carbon energy source, a population of denitrifying bac-teria, pH 5-9, little or no molecular oxygen, and temperature 5-60 degrees C. There is not sufficient organic arbon in a well-nitrified swine waste effluent, however, adding raw swine manure at a feed rate of BOD5 = 3.26 NO3- N gives an efficiency of nitrogen removal of 91 percent. (Dorland-lowa State) W72-08398

OPERATION OF AN ANAEROBIC POND ON HOG ABATTOIR WASTEWATER, Steeg (Henry B.) and Associates, Inc., Indianapolis, Ind.; and Wastewater Treatment Plant, Logansport, Ind. C. F. Niles, and H. P. Gordon. In: Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University, Engineering Extension Series No. 137, Part II, p 612-616, 1 tab.

Descriptors: *Waste water treatment, *Operating costs, Anaerobic conditions, Effluents, Activated sludge, Biochemical oxygen demand, Labor, Pretreatment, Management, Indiana, *Lagoons, *In-

dustrial wastes.

Identifiers: *Abattoir wastewater, Anaerobic lagoons, Secondary treatment, Suspended solids.

The development of a design for an anaerobic pond for pretreatment of the wastewater from an abattoir, design criteria and details of the anaerobic pond, and the operating techniques being used in treating the effluent from the anaerobic pond hefore discharge to the river we described. Some in treating the effluent from the anaerobic pond before discharge to the river are described. Some information on operating results, labor requirements and power consumption are also included. It was estimated that processing 400 hogs per hour on a one shift kill would result in a flow of 800,000 gal per day with a peak rate of 1400 gal per min. It gai per day with a peak rate of 1400 gai per min. it was further estimated that this wastewater would contain 8000 pounds of BOD and 6650 pounds of suspended solids per day. The effluent from the lagoon was introduced into the activated sludge secondary treatment step of the city sewage treatment plant. For successful operation on a yearround basis, a cover for the lagoon was considered necessary. The cover was composed of straw and grease and maintained temperatures year-round above 80 degrees F. (Dorland-Iowa State) W72-08399

ODORLESS PORK PRODUCTION: FROM CON-

CEPTION TO MARKET, Smart (Paul) Hog Farm, Lawrence, Kans.; and Kansas Univ., Lawrence. Dept. of Civil Engineer-

ing.
P. Smart, and R. E. McKinney.
In: Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University, Engineering Extension Series No. 137, Part 2, p 757-760, 4 ref.

Descriptors: *Farm wastes, *Aerobic treatment, *Waste treatment, Hogs, Aeration, Confinement pens, Activated sludge, Biochemical oxygen demand, Rotors, Odor, Anaerobic conditions. Identifiers: *Swine confinement, Concrete slats, Mechanical breakdown, Oxidation ditch.

The world is faced with an ever-increasing popula-tion and an ever-increasing food demand. One of the most critical food demands is for high quality meat protein. It has been possible to meet the pork needs without intensified animal growing. But the future indicated that a change was needed. In the summer of 1965, a project began to take shape that was to result in a major hog growing operation which would set the pattern for a new concept in producing pork. It was proposed that a complete animal confinement system be constructed near Lawrence, Kansas, which would yield 10,000 mar-ketable hogs per year. This confined hog system was designed to provide the optimum environment

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

for the animals from conception to market. One thing was apparent; no one had fully solved the problem of manure disposal. Odor nuisances created by hog manure, especially during removal and spreading, required location a considerable distance from other people. Biological concepts employed in wastewater treatment systems provided the answers needed to solve the hog manure disposal problem. The system employed a system aerobic treatment under slotted floors. (Dorland-Iowa State)

FEED LOT WASTE IN FLORIDA, Orange County Pollution Control Dept., Orlando, Fla.; and Soil Conservation Service, Orlando, Fla. Fla.; and Soil Conservation Ser C. W. Sheffield, and B. Beville.

In: Proceedings, Industrial Waste Conference, 25th, May 5, 6, and 7, 1970. Purdue University Engineering Extension Series No. 137, Part 2, p 914-918, 1 fig.

Descriptors: *Waste treatment, *Biological treatment, "Waste disposal, Subsurface drains, Sprin-kler irrigation, Aerobic treatment, Anaerobic digestion, Dairy industry, Cattle, Biochemical ox-ygen demand, Turbidity, Retention, "Farm wastes, "Feed lots, Costs. Identifiers: Grit chambers, Polishing ponds, Sand

The problems associated with animal waste disposal are becoming tremendous compared to just a few years ago. An increased number of animals has created a problem of wastes from feedlots. It has been estimated that animal waste is ten times that from human waste, or approximately 55 pounds of manure per person would be one way of estimating the amount of manure from a feedlot operation. Therefore, it could be assumed that approximately two pounds per day of BOD as runoff is associated per steer or cow. Various methods of treating animal wastes from feedlot operations were reviewed and the most practical and economical means of treating the waste from dairy and beef cattle was determined. Construction and maintenance costs for a waste treatment facility for 800 dairy cows is presented. The treatment method consists of a grit chamber followed by an anaerobic pond, then an aerobic pond and a polishing pond. The effluent is discharged through a three to five acre sub-surface drain and a five acre spray irrigation system. (Dorland-Iowa State) W72-08403

BIOLOGICAL WASTE TREATMENT.

Biotechnology and Bioengineering Symposium, No. 2, Interscience Publishers, a division of John Wiley and Sons: New York, N. Y., London, England. R. P. Canale, editor, 1971. 177 p. Illus. Identifiers: *Biological treatment, Engineering, Symposium, Technology, *Waste treatment, Symposium, Technology *Kinetics, *Mass transfer. Technology,

This volume in the series contains the proceedings of a symposium presented before the Division of Microbial Chemistry and Technology at the 160th National Meeting of the American Chemical Society, Chicago, Illinois, on Sept. 16, 1970. This symposium on biological waste treatment was conducted under the joint sponsorship of the Division of Microbial Chemistry and Technology and the Division of Water, Air and Waste Chemistry of the ACS. The papers and symposium review the current state of biological waste treatment technology, outline existing research and operational problems and promote the exchange of information among experts concerned with biological processes. This volume contains 9 of the 15 papers presented. Papers describe basic physical phenomena common to most waste treatment and fermentation operations: biological kinetics and liquid phase and liquid-solid phase mass transfer. Also described is the current application, design and operation of common waste treatment processes. The final papers in the program deal

with biological waste treatment control and process optimization. Papers include bibliographies, and author and subject indexes are provided.—Copyright 1972, Biological Abstracts, Inc. W72-08475

5E. Ultimate Disposal of Wastes

HYDROGEOLOGIC CONSIDERATIONS IN THE SITING AND DESIGN OF LANDFILLS, For primary bibliographic entry see Field 04B. W72-08162

SOLID-WASTE DISPOSAL GEOHYDROLOGIC ENVIR ENVIRONMENT MARYLAND, Geological Survey, Parkville, Md. For primary bibliographic entry see Field 05B. W72-08221

5F. Water Treatment and **Quality Alteration**

NOVEL WATER TREATING AND STORAGE APPARATUS, Dow Chemical Co., Midland, Mich. (Assignee).

For primary bibliographic entry see Field 05D. W72-07976

PROCESS FOR WASHING OPEN OR GRAVITATIONAL FILTERS FOR THE PURIFI-CATION OF WATER, For primary bibliographic entry see Field 05D. W72-07985

DISINFECTION.

Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08107

DISTILLATION APPARATUS TO RECOVER POTABLE WATER FROM NON-POTABLE WATER,

WALER, J. Arvan. U. S. Patent No. 3,522,149, 4 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office Vol. 876, No. 4, p. 945, July 28, 1970.

Descriptors: *Patent, *Distillation, Potable water, Sea water, *Desalination apparatus, Equipment, Separation techniques, *Water treatment, Water purification, *Condensation, Heat transfer.

A wate:-purifying unit consists of a lower chamber for heating the non-potable water and upper chambers for heat transfer and condensation. A funnellike arrangement is used to transfer the vaporized water upwards into the condensation chamber. (Sinha-OEIS) W72-08168

APPARATUS FOR CONCERVIRUSES FROM LARGE VOLUMES, CONCENTRATING Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology. C. Wallis, A. Homma, and J. L. Melnick. Journal of the American Water Works Association, Vol. 64, No. 3, p. 189-196, March 1972, 8 fig, 4 tab, 12 ref.

Descriptors: *Viruses, *Separation techniques, Public health, Adsorption, "Membranes, "Filtra-tion, Fouling, Dissolved solids, Turbidity, "Waste water treatment, "Water treatment.

In removing virus from waters, cellulose membranes and insoluble polyelectrolyte layers have produced excellent results as long as no other pol-lutants are present. However, in order to separate

viruses from turbid waters, some form of treatment is required to remove the turbidity first before trying to separate out the viruses. Ten-inch Fulflo' yarn-wound filters made of various tex-tiles and wound over corrosion resistant per-forated cores were demonstrated to give the progressively finer filtration capabilities necessaprogressively finer filtration capabilities necessary, while providing much greater solids retention capacity than is associated with surface filter media of the same dimensions. To test the system, one milliliter of poliovirus (1200 infectious units) was added to 50 gal of dechlorinated tap water. The flow rate was 300 gph and MgCl2 was added to aid binding of the virus. 83% of the initial input was recovered from the cluate of the cellulose membrane. However, no virus remained in the membrane. However, no virus remained in the water, signifying that while 100% of the virus had been removed from the water, only 87% was recovered from the filter. By using the tween-80 treatment for the fibers selected and addition of the Amberlite anion resin, the cellulose membrane was completely spared from non-viral com-ponents, and no virus was held back from reaching the virus-adsorbent membrane. (Lowry-Texas)

GRANULAR CARBON FILTERS FOR TASTE

AND ODOR REMOVAL, Water Purification Plant and Pumping Station, Mt. R. E. Hansen.

Journal of the American Water Works Associa-tion, Vol 64, No. 3, p 176-181, March 1972, 11 fig, 2 ref.

Descriptors: *Taste, *Odor, *Potable water, Activated carbon, Adsorption, Filtration, Algae, Phenols, Detergents, Pesticides, Operation and maintenance, *Water treatment, *Michigan. Identifiers: *Carbon regeneration, *Backwashing, *McClemer (Mich) *Mt Clemens (Mich).

The Mt. Clemens, Michigan Water Purification Plant experienced taste and odor problems for 33 years, starting with septic and phenol tastes and odors and gradually moving towards Actino-mycetes and algal produced tastes and odors. Although powdered activated carbon slurries were somewhat effective in keeping down the taste and odor problems, there was not enough slurry han-dling capacity to eliminate the problem. Efforts toward improving and expanding carbon slurry operations were terminated when it was found that granular activated carbon with an effective size of 0.55 to 0.65 mm and a uniformity coefficient of 1.4-1.7 could be used in the existing sandfilters. Since placing the activated carbon filters on line, no further taste and odor problems have been en-countered. Based on a 3 year life, a total installed cost of \$4.97/million gallons of water treated or \$0.05/month/household was computed. In addition to removing taste and odors, as well as doing an excellent filtering job, the carbon filters also remove all organics, detergents, and pesticides. (Lowry-Texas) W72-08357

DETERMINING PHOSPHATE ADDITIVE FOR IRON CONTROL IN WATER,

Rensselaer Polytechnic Inst., Troy, N.Y. D. B. Aulenbach.

Journal of the American Water Works Association, Vol 63, No. 3, March 1971, p 197-198.

Descriptors: *Iron compounds, *Corrosion, *Scaling, *Chemical precipitation, *Phosphates, Solubility, Oxidation reduction potential, Hydrolysis, Aeration, Temperature, Mixing, Hydrogen ion concentration, Anaerobic conditions, Laboratory tests, Sampling, *Water treatment.

Although phosphate additions have previously been recognized as being useful in the control of iron problems in drinking water, the choice of the best phosphate for use in an empirical situation cannot be determined analytically. Therefore an empirical method has been devised to establish: (1)

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Water Treatment and Quality Alteration—Group 5F

the best phosphate for a particular water; (2) the optimum concentration of that compound to produce the desired results; and (3) the pH at which this concentration of phosphate will be most effective. First, a two liter sample bottle, contain-ing a sample of the water to be tested, is dosed at a rate of 2 parts PO4 to 1 part of iron in the water. The sample should not be agitated or aerated be-fore the phosphate is mixed in. After addition of the various phosphates, all mixtures should be placed in a multiple stirrer arrangement and stirred at 25 rpm. By varying the phosphate levels and proceeding to breakdown of the system (2 weeks or less), optimum phosphate compound and dosage can be established. By repeating the tests with the optimum compound and varying the pH, the final optimum conditions are established, and this knowledge can then be applied to the full scale operation. (Lowry-Texas) W72-08359

MANFORCE, A PROGRAM OF THE WATER POLLUTION CONTROL FEDERATION, Water Pollution Control Federation, Washington,

For primary bibliographic entry see Field 05D.

HEALTH FACTORS IN THE RE-USE OF WASTE WATER FOR AGRICULTURAL, IN-DUSTRIAL, AND MUNICIPAL PURPOSES, Hebrew Univ., Jerusalem (Israel). Environmental Health Lab. For primary bibliographic entry see Field 05D.

NITRATE AND WATER,

Missouri Univ., Columbia. Dept. of Soils. For primary bibliographic entry see Field 05B. W72-08389

HYPOTHESES OF CARIES PROPHYLAXIS WITH FLUORIDES, (IN GERMAN),

Institut fuer Umweltforschung, Graz (Austria). Rudolf Ziegelbecker.

Prot Vitae. 16 (3): 105-109. 1971. English summary. Identifiers: Caries, Fluorides, Hypotheses, Metab-Drug, Prophylaxis.

The introduction and world-wide recommendation of caries prophylaxis with fluorides is based on the supposition that fluorides possess considerable ca-ries prophylactic effects. This work analyzes the authentic medical fundamental statistics and points out that the premises for the recommendation by WHO lack any scientific foundation. The artificial fluoridation of drinking water is no imitation of nature, but tries to regularize an exception established by nature itself. The reference material shows certain relations between different facts which could be interesting in view of a clarifica-tion of functional correlations in the biosphere.--Copyright 1972, Biological Abstracts, Inc. W72-08391

MOUSE GROWTH AND REPRODUCTION IN BIOASSAYS OF WATER QUALITY FROM CERTAIN NATURAL AND MUNICIPAL WATER SOURCES IN NEW MEXICO, New Mexico State Univ., University Park. Dept. of Animal Science.

J. D. Tracy. M. S. Thesis, 1971, 55 p, 12 tab, 24 ref, 1 append. OWRR A-029-NMEX (1).

Descriptors: *Small animals (Mammals), Water chemistry, *Growth, *Reproduction, Animal physiology, *Water quality, Domestic water, Laboratory animals, Rodents, *Bioassay, *New Mexico, *Potable water, Water analysis.

Identifiers: *White mice (Mus musculus), Growth trials, Reproduction trials.

Growth and reproduction by albino mice (Mus musculus) were used as bioassays of quality of drinking water from various sources of importance to New Mexico. Drinking waters were characterized chemically in terms of electrical conductivity, total dissolved solids, and contents of Ca, Mg, CO3, HCO3, C1, SO4, Na and K. Sixty-eight samples of drinking water varying in overall samples of drinking water varying in overall mineralization from less than 1 part per million of total dissolved solids to several thousand parts per million were studied in three separate bioassay trials, each involving twenty to twenty-six sources. No significant differences were observed due to water sources in terms of either mouse growth or reproduction, although the precision of the bioas-says was sufficient to detect highly significant differences in both growth and reproduction due to the position of mouse cages on the batteries (racks) in a laboratory affording reasonable control of temperature, humidity, and light. (Creel-New Mexico) W72-08454

INTERNAL CORROSION OF UNLINED WATER MAINS. Black and Veatch, Kansas City, Mo.

T. C. Hoppe. Water and Sewage Works, Vol. 117, No. 2, p 42-46, February 1970. 1 tab, 13 ref.

Descriptors: *Water treatment, *Water quality, *Corrosion, Velocity, *Cast-iron, *Steel, Monitor-

Identifiers: *Distribution systems, *Plastic piping, Chemical treatment.

Difficulties in maintaining water quality in conventional (unlined) systems, with a minimum of corrosion and scaling, are practically insurmountable; there are too many uncontrollable variables. Cement-lined cost iron and steel piping now available avoids corrosion except at taps, joints and where welds destroy linings. Plastic (non-metallic) pipings are being chosen where possible. Flow and corrosion, corrosion rate determination, scaling rates, cleaning, and corrective action are discussed. Major problems will continue with installations of unline pipe. Protective film deposition or protective linings will be used to arrest cor-rosion and tuberculation. Induced circulation can reduce corrosion where feasible. Test programs and periodic monitoring should identify deficien-cies that should be corrected either through change in overall water quality or through additional chemical correction. These should be done without depending upon consumer opinions or reactions as the criteria for action. (Bean-AW-WARF)

AN ADVANCED WATER FILTRATION PLANT, Environmental Control Systems Co., Berwyn, Pa. F. V. Frissora.

Water and Sewage Works, Vol. 118, No. 11, p 365-369, November 1971. 5 fig, 3 tab.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, *Design, *Flow rates, *Head loss, Siphons, Automation, Timing, Pilot plants, *Filters, Treatment facilities. Identifiers: *Dual-flow filters, Infilcarb.

Experimental results from operation of a 4 ft diameter dual-flow filter have been used as justifi-cation for construction of 4 filters of 260 sq. ft. combined area for an output of 20 mgd. Good results were reported at rates up to 9 gpm/sq ft. filter bed surface area. The effluent collector and filter bed surface area. The effluent collector and washwater distributing 'bottom' is at mid-depth of the bed. The upper part consist of 14 in. of 'Inficarb' on 13 in. fine sand surrounding the mid-bed collector. Below this level is a varied layer of coarser media and supporting gravel. Water enters the filter at both top and bottom of the bed and is removed at the mid-depth collector. Head loss through the upper and the lower portions tend to equalize the flow-the total effluent is metered. All sequences of transfer of water between flumes is controlled by siphons with automatic control
which can be activated by time cycle, loss of head,
or turbidity in effluent water. (Bean-AWWARF)
W72-08462

NEW DEVELOPMENTS IN WATER PURIFICA-

TION, Army Mobility Equipment Research and Develop-ment Center, Fort Belvoir, Va. Sanitary Sciences

Water Well Journal, Vol. 25, No. 10, p. 29-32, Oct. 1971, 3 fig, 1 tab, 2 ref.

Descriptors: *Water treatment, *Disinfection, *Coagulation, Filtration, *Polyelectrolytes, *Diatomaceous earth, *Water purification, Filters. Identifiers: *Multi-media filters, *Cartridge filters.

Developments in water purification are discussed. including (a) disinfection properties and oxidizing properties of calcium hypochlorite, sodium hypochlorite, chlorine, bromine, iodine, czone, chlorine, chl and ultraviolet; (b) coagulation and filtration, (c) less permeable filters, (d) throw-away cartridge filters for iron removal, for home-owner use, (e) diatomite filters, (f) multi-media filters of anthracites, and garnet, and (g) polyelectrolytes. (Bean-AWWARF) W72-08464

WATERWORKS 'BUYS' REGIONALISM, EYES OTHER SYSTEMS

Water Authority, Chester, Pa. V. A. Appleyard. Water and Wastes Engineering, Vol. 8, No. 6, p.46-47, June 1971. 1 fig.

Descriptors: Sanitary engineering, *Water supply, *Regional analysis, Resources, *Resource development, Filtration, Administration, *Regional development, *Water resources development, *Water supplier sup ment, *Pennsylvania.

A public water supply was established by private investors in 1868, on the Delaware River at Chester, to serve the community of about 9,000. By 1900 it had grown to serve 10 townships and boroughs, encompassing 18 sq. miles and 80,000 people. Growth continued and in 1938 the water company became the Chester Water Authority. Because the Delaware was badly polluted, a new water supply was established on Octoraro Creek 40 miles west of Chester and an 18 mgd treatment plant was built. It was put in service in 1951 and in less than 5 years the capacity had to be expanded to 30 mgd. Water consumption rose rapidly and in the early 60's it became evident that with the addition of new areas and industrial use (now 60% of all consumption) growth would be at the rate of 1 mgd per year. Plans were made for doubling system capacity. A 30 mgd pumping plant was built on the Susquehanna River to deliver water into the upper reaches of the Octoraro. Research on 'Hi-Rate' filtration beds indicates that water can travel through the settling basins at twice the design rate and through these filters to produce higher quality water than through the old rapid sand filters. Therefore, modernization of equip-ment is expected to be relatively inexpensive. The Authority has bought some adjacent water systems, contracted to sell water wholesale to some waterworks adjacent to their 40 mile transmission main, and is looking for other territories.
(Bean-AWWARF)
W72-08465

WATER PRETREATMENT FACILITIES LICK ALGAE PROBLEM, Oshkosh Dept. of Public Works, Wis.

J. Strauss.

Public Works, Vol. 94, No. 4, p. 94-95, April 1963. 2 photos.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5F-Water Treatment and Quality Alteration

Descriptors: *Water treatment, *Design, *Intake, Sedimentation, *Head loss, Taste, Odor, *Treat-ment facilities, *Filtration. Identifiers: *Filter runs, Backwash, *Chemical

Short filter runs and use of 9.8 percent backwash water were caused by prolific growths of blue-green algae. Chlorine, alum and activated carbon added in the plant reduced tastes and odors but did not eliminate sufficient algae. The city decided to remove algae by retention and chemical treatment before it entered the plant. An earthen dike enclosed a 30-acre area in a bay near the plant, with capacity of 61.6 mg. Baffle walls were provided to reduce short circuiting. A 36-in intake line was assembled on shore, floated into place and sunk into a trench dredged in the lake bottom, with four 36in elbows protruding above the lake floor to serve as intake. This line transmits water from below the lake surface into the new presettling basin. To combat algae during summer months, 2.5 mg/L liquid copper sulfate is applied to the raw water as it enters the basin. This basin is connected to a wet well in the plant. From the wet well, water is forced by low-lift pumps to a slow mixing basin where chlorine, activated carbon and alum are added. The water then passes through a series of conventional settling tanks and filters to a clear well. During the first five months the new facilities reduced washwater use from an average of 8 percent to 2.6 percent, and cost of chemicals dropped by 30.8 percent. (Bean-AWWARF) W72-08466

RECOVERY OF SMALL QUANTITIES OF VIRUSES FROM CLEAN WATERS ON CELLULOSE NITRATE MEMBRANE FILTERS, Environmental Protection Agency, Cincinnati,

G. Berg, D. R. Dahling, and D. Berman. Applied Microbiology, Vol 22, No 4, p 608-614.

Identifiers: Cellulose, Coxsackievirus, Echovirus, *Membrane, Nitrate, Poliovirus, Reovirus, *Viruses, *Analytical *Filters, techniques, Water treatment.

A method is described for quantitatively recovering small amounts of viruses from large volumes of buffered, distilled water. Development of the method was motivated by the anticipated need for testing large volumes of renovated sewage for viruses. The method consists of adsorbing viruses onto cellulose nitrate membrane filters (0.45 micro m pore size) from water containing sufficient Na2HPO4 to produce a molarity of 0.05 and sufficient citric acid to produce a pH of 7, and eluting the adsorbed viruses in 3% beef extract under extended sonic treatment. Complete recovery of poliovirus 1, echovirus 7, and coxsackievirus B3 resulted when less than 100 plaque-forming units were added to 1-liter quantities of water. Recoveries of reovirus 1 were almost as good. Preliminary studies indicate that good recoveries can be made from 25-gal quantities of water. The method is efficient in waters of high quality and may be useful for recovering viruses in renovated, and perhaps in tap waters, but not in waters containing certain -Copyright 1972, Biological Abstracts, Inc. W72-08477 organic matter unless that matter is first removed .-

A STUDY OF LITERATURE ON THE RELA-TIONS BETWEEN HEART AND CIRCULATO-RY DISEASES AND THE DEGREE OF HARD-NESS OF DRINKING WATER (IN GERMAN), U. Grabow

Prot Vitae. Vol 16, No 3, p 131-133, 1971. English summary.

Identifiers: Canada, Circulatory diseases, England, Hardness, Heart, Human, Japan, Literature, Netherlands, Sweden, *Public health, *Pota-

A survey is given of publications reporting the relations between heart and circulatory diseases and the degree of hardness of drinking water. Experiments made in America, England, Canada, Japan, Sweden, and the Netherlands are considered. In all these countries mortality from heart and circulatory diseases was higher in areas with and circulatory diseases was higher in areas with soft drinking water than in regions where drinking water showed a higher degree of hardness. It seems that the higher Ca and Mg content of hard water has a protective effect. The damaging effect of soft water is attributed to Cd which is dissolved from alloyed water pipes by the more aggressive soft water. According to present investigations a real 'water factor' which could be held responsible for the increase in the rates of mortality, remains hypothetical. A number of studies point to the fact that the degree of hardness of drinking water may be but 1 of several possible causes of the increased incidence of the above diseases.--Copyright 1972, Biological Abstracts, Inc. W72-08482

5G. Water Quality Control

SOME CANONS OF SOUND EXPERIMENTA-

TION, National Bureau of Standards, Washington, D. C. Statistical Engineering Lab.
For primary bibliographic entry see Field 07C.

ALGAE CONTROL BY MIXING, STAFF RE-PORT ON KEZAR LAKE IN SUTTON, NEW HAMPSHIRE.

New Hampshire Water Supply and Pollution Control Commission, Concord.

Available from the National Technical Information Service as COM-71-01087, \$3.00 in paper copy, \$0.95 in microfiche. December 1970. 103 p, 28 fig, 30 tab, 76 ref.

Descriptors: Water quality control, *Cyanophyta, Water analysis, Lakes, Sampling, Diatoms, Turbidity, Water pollution sources, Nutrients, Sewage, Water quality, Aeration, Water properties, *New Hampshire, Algae, Color, Coppersulfate, Nets, Hydrogen ion concentration, Phosphates, Nitrogen, Hardness (Water), Conducrhosphates, Nutlogen, Hardness (Water), Conductivity, Zinc, Water temperature, Alkalinity, Chlorides, Copper, Manganese, Dissolved oxygen, Iron, Light penetration, Chlorophyta, Pipes, Mechanical equipment, Nitrates, Eutrophication, Carbonates, Carbon dioxide, Water pollution effects Mississe fects, Mixing. Identifiers: *Kezar Lake (N.H.), Aphanizomenon,

Anabaena spp, Microcystis aeruginosa, Aphanizomenon holsaticum, Ictalurus nebulosus, Notemigonus crysoleucas, Catostomus commercommersonii, Asterionella Orthophosphates, Secchi disc, Newfound Lake, Squam Lake, Aphanizomenon flow-aquae, Destratification, Anabaena flow-aquae, Homogenizing, Transparency.

Kezar Lake is a New Hampshire recreational lake, which in 1964 was obviously suffering from objectionable algae bloom. After several copper sulfate treatments failed to solve the problem, a destratification process was attempted. This was accomplished by forcing compressed air, from shore-located compressors, through P.V.C., 2-inch diameter piping to the deepest portion of the lake where it was released through ceramic diffusers, and allowed to bubble up to the lake surface through the water column. Clarity of the water was visibly and measurably improved; the populations of noxious algae, so objectionable to recreation interests, were decreased in number; and no harmful effects were detected during 1968 and 1969 summer mixing of Kezar Lake. Many improvements in various water quality parameters were also noted. Operating pressures for the compressors are low. The equipment is convenient for necessary maintenance, and the operating and study budget is modest. (Mortland-Battelle) W72-07890 ATMOSPHERIC AMMONIA: ABSORPTION BY PLANT LEAVES, Agricultural Research Service, Fort Collins, Colo.

Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05B. W72-07959

MODELS FOR MANAGING METROPOLITAN SURFACE WATER SYSTEMS, Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center. For primary bibliographic entry see Field 06A. W72-07996

MATHEMATICAL PROGRAMMING FOR RE-GIONAL WATER QUALITY MANAGEMENT, California Univ., Los Angeles. School of Busi-

ness. G. W. Graves, G. B. Hatfield, and A. B. Whinston. Water Resources Research, Vol. 8, No. 2, p 273-290, April 1972. 13 fig, 12 tab, 5 ref.

Descriptors: *Estuary, *Water quality control, Delaware River Basin Commission, Optimization, Systems analysis, *Mathematical models, Water temperature, Biochemical oxygen demand, Dissolved oxygen, Flow, Linear programming, Model studies, *Regional analysis.
Identifiers: *Delaware Estuary, *Regional treatment systems, By-pass piping.

A mathematical model was developed to define minimum cost water quality control policies in the Delaware Estuary. Control alternatives included treatment at the waste source and by-pass piping with regional treatment. The model was solved using both linear and non-linear programming algorithms. A small-scale problem with five dischargers, three estuary sections, and three potential treatment plants was set up to illustrate the methodology used. The results indicated that a regional treatment system for the Delaware Estuary is less costly than other proposed schemes. (Bell-Cornell) W72-07998

PROPOSED SEWAGE TREATMENT FACILI-TIES, SOLDOTNA, ALASKA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 05D. W72-08017

GREAT LAKES STATES' PHOSPHORUS-DETE-RGENT LEGISLATION: STATUS REPORT, STATE LEGISLATURES ACT ON BILLS TO PROTECT SHORE AND WATERS OF LAKES. For primary bibliographic entry see Field 06E. W72-08024

AN ACT TO RATIFY THE ARKANSAS RIVER AN ACT TO KATTEY THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS-OKLAHOMA, 1970, AND TO SET FORTH THE PROVISIONS OF SAID COMPACT.
For primary bibliographic entry see Field 06E.

ANNUAL REPORT 1971. Delaware River Basin Commission, Trenton, N.J. For primary bibliographic entry see Field 06E. W72-08026

W72-08025

WATER QUALITY STANDARDS-ADOPTION, IDENTIFICATION, AND AVAILABILITY OF STATE STANDARDS,

Environmental Protection Agency, Washington, W. D. Ruckelshaus. Federal Register, Vol 37, No 58, p 6087-6088, March 24, 1972.

Water Quality Control—Group 5G

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *State govern-ments, *Water quality control, Legislation, Legal aspects, Regulation, Federal government, Adoption of practices, Standards, Water quality.

Pursuant to the authority of section 10 (c) of the Federal Water Pollution Control Act, 33 U.S.C. 1160 (c), the Administrator of the Environmental Protection Agency, with certain amendments, adopts water quality standards of the following states: Alaska, Colorado, Connecticut, Delaware, states: Alaska, Colorado, Connecticut, Delaware, Territory of Guam, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Rhode Island, South Dakota, Vermont, Virginia, Virgin Islands, and West Virginia. Such standards are intended to protect public health or welfers and process wester questive and health or welfare, enhance water quality, and serve the purposes of the Act. (Ilkson-Florida) W72-08029

GREAT LAKES AND UPPER MISSISSIPPI RIVER STATES CONCERNED ABOUT SEWAGE FROM BOATS AND SHIPS, Congress, Washington, D.C.; and House, Washington, D.C. For pr. aary bibliographic entry see Field 06E. W72-08031

DRAWBRIDGE OPERATION REGULATIONS (OPPOSITION TO REGULATIONS ON BASIS OF RIVER POLLUTION), Washington, D.C. Office of Marine Environment

and Systems. For primary bibliographic entry see Field 06E. W72-08033

NAVIGABLE WATERS SAFETY AND EN-VIRONMENTAL QUALITY ACT. Congress, Washington, D.C.; and Committee on Commerce (U.S. Senate).

Hearings, 92d Cong, 1st Sess, September 22, 23, 24, 1971. 445 p, 24 fig, 44 tab, 97 ref.

Descriptors: *Legislation, *Navigable water, *Safety, *Harbors, *Federal government, *Ships, Navigation, Legal aspects, Law enforcement, Accidents, Transportation, Inspection, Permits, Regulation, Water pollution, Water quality, Porlution abatement, Environmental sanitation. Identifiers: *Coastal waters.

The bill is intended to promote the safety and protect the environmental quality of ports, waterfront areas, and navigable waters. Topics discussed include ship design and construction standards, marine terminal regulations, and the prevention of oil pollution from tankers. Witnesses included representatives from the Department of Com-merce, Department of State, Department of Transportation, Coast Guard, American Association of Port Authorities, American Association of Merchant Shipping, and the Sierra Club. The text of the bill is included. (Ilkson-Florida) W72-08034

FEDERAL WATER POLLUTION CONTROL ACT OF 1972. Congress, Washington, D.C.; and House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-08035

CONTINUING RESOLUTION FOR WATER POLLUTION CONTROL, Congress, Washington, D.C.; and House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-08037

STATE DEPARTMENT OF NATURAL RESOURCES V. CLINTONVILLE (MUNICIPAL LIABILITY FOR FISHKILLS RESULTING FROM UNAUTHORIZED LOWERING OF

For primary bibliographic entry see Field 06E. W72-08038

ORAL PROCEEDINGS--CANADA'S ANTI-PO-LLUTION LEGISLATION.

Oregon Law Review, Vol 50, p 491-503, Spring 1971.

Descriptors: "Canada, "Oil pollution, "Interna-tional law, "International waters, Law of the sea, Foreign waters, Foreign trade, Oil industry, Oil wastes, Oil, Arctic Ocean, Atlantic Ocean, Pacific Ocean, Navigation, Transportation, International commissions, Legal aspects, Jurisdiction, Govern-ments, Legislation, Governmental interrelations.

The major commentators in these oral proceedings are Professor Green, Jon L. Jacobson, Jared Carter, Laird Kirkpatrick, Joel Hedgpeth, and Phillip S. Berry. Canada's new anti-pollution legislation extends Canadian jurisdiction 100 miles into the Atlantic, Pacific, and Artic Oceans in order to protect against oil pollution. Major critical control of the protect against oil pollution. Major critical control of the protect against oil pollution. cism centers around the premise that the legisla-tion is a violation of international law and erodes the concept of freedom of the seas. It was also argued that Canada's refusal to allow its anti-pollu-tion legislation to be considered by the International Court of Justice establishes a dangerous precedent and may defeat the chances of a suc-cessful international convention to rewrite existing maritime law. Professor Green defends the legislation on the basis of state self-defense in the preservation of economic welfare necessitated by the general insensitiveness of the international law making process. Concern was expressed that if the Canadian legislation model is adopted by other na-tions the oceans will ultimately be divided into national lakes, thereby completely eroding freedom of the seas. (Blank-Florida) W72-08040

OIL POLLUTION: NEGOTIATION--AN ALTER-NATIVE TO INTERVENTION, Office of the Judge Advocate General (Army), Washington, D.C.

For primary bibliographic entry see Field 06G. W72-08043

IMPROVING SURFACE WATER CONDITIONS THROUGH CONTROL AND DISPOSAL OF AQUATIC VEGETATION, PHASE I: PROCESSING AQUATIC VEGETATION FOR IMPROVED HANDLING AND DISPOSAL OR UTILIZATION, Wideling Deat of Agricultural

Wisconsin Univ., Madison. Dept. of Agricultural Engineering; and Wisconsin Univ., Madison. Dept. of Mechanical Engineering. For primary bibliographic entry see Field 04A. W72-08069

PROCEDURES FOR REMOVING SURFACE CONTAMINANTS FROM DEEP ICE CORES, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 02C. W72-08094

QUESTIONS AND ANSWERS ON WATER QUALITY STANDARDS. Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, September 1971.

Descriptors: *Water quality standards, *Reviews, *Water Quality Act, *Water pollution control,

*Administrative agencies, State Government, Federal Government, Water quality control, Domestic water, Recreation, Industrial water, Municipal water, Streams, Water pollution, Agricul-ture, Environmental effects, Ecology, Aquatic

life, Fish, Wildlife.
Identifiers: *State regulations, *Water quality criteria, *Water pollution control administrators.

Fifty questions and answers on water quality stanand answers on water quality standards are presented. The water quality standards program was provided for in the Water Quality Act of 1965. This Act is part of the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.). The water quality standards program is directed by the Environmental Protection Agency, an independent regulatory agency which has responsibility for approving State-adopted standards, evaluating adherence to the standards, and overseeing enforcement of standards compliance. overseeing enforcement of standards compliance. Standards, the first nationwide strategy for water quality management, contain four major elements: the use (recreation, drinking water, fish and wildlife propagation, industrial, or agricultural) to be made of the interstate water; criteria to protect those usea; implementation plans (for needed industrial-municipal waste treatment improvements) and enforcement plans; and an antidegradation statement to protect existing high quality waters. statement to protect existing high quality waters. A list of State and Interstate water pollution control administrators is included. (See W72-08100 thru W72-08108) (Woodard-USGS) W72-08099

DISSOLVED OXYGEN CRITERIA. Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, November 1971.

Descriptors: *Water quality standards, *Dissolved oxygen, *Water pollution control, *State Government, *Federal Government, Water Quality Act, Domestic water, Recreation facilities, Lakes, Streams, Ecology, Fish, Wildlife, Industrial wastes, Estuaries, Municipal water, Agricultural runoff, Environmental effects, Documentation. Identifiers: *Water quality criteria, *State regula-

Minimum dissolved oxygen criteria limitations within individual State-adopted water quality standards are presented. Water Quality Criteria (report by the National Technical Advisory Committee), used by EPA in evaluating the State standards recommends a minimum DO concentration for freshwater biota of 5 mg/liter for warmwater spereshwater blots of 5 mg/inter for warmwater spe-cies (declining to a lower limit of 4 mg/liter for short periods of time, provided that the water quality is favorable in all other respects); and for coldwater biota, no less than 5-6 mg/liter (7 mg/liter at spawning times). Stringent limitations (6 mg/liter) are recommended for small inland lakes or large lakes which have insufficient or no mixing of constituent layers. For saltwater organ-isms DO minimum levels of 5 mg/liter are recommended in the open coastal waters, and 4 mg/liter in the estuarine and tidal tributaries, excepting waters with naturally depressed DO. (See also W72-08099) (Woodard-USGS) W72-08100

RADIOLOGICAL CRITERIA. Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, May 1971. 8 p.

Descriptors: *Water quality standards, *Radioactivity, *Water pollution control, *State Governments, *Federal Government, Fallout, Water Quality Act, Domestic water, Recreation facilities, Nuclear energy, Ecology, Fish, Wildlife, Industrial wastes, Municipal water, Environmental effects, Documentation.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

Identifiers: *Water quality criteria, *State regula-

Radiological criteria limitations within State-adopted water quality standards are presented. Since radioactive materials such as radium, stron tium 90, and tritium are toxic to man as well as being cumulative in his system, these pollutants are subject to control, monitoring, and measure-ment whatever the contact medium. The EPA recommended criteria limits on these materials in water are: Gross Beta, 500 pc/liter; radium, 1.0 pc/liter; strontium-90, 10.0 pc/liter; and tritum, 3000.0 pc/liter. (See also W72-08099) (Woodard-W72-08101

PHOSPHATE CRITERIA.

Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, June 1971. 21 p.

*Water quality Descriptors: standards. Descriptors: "Water quanty standards, "Phosphates, "Water pollution control, "State Government, "Federal Government, Water Quali-ty Act, Domestic water, Recreation facilities, Ecology, Fish, Wildlife, Industrial wastes, Mu-nicipal water, Agricultural runoff, Environmental effects, Documentation.

Identifiers: *State regulations, *Water quality

Phosphate criteria limitations within individual State-adopted water quality standards are presented. The National Technical Advisory Committee in its Water Quality Criteria report recom-mended that levels of phosphate in flowing streams should not exceed 100 micrograms/liter and that naturally occurring ratios and amounts of nitrogen (particularly NO3 and NH4) to total phosphorus should not be radically changed by ar-tificial means. (See also W72-08099) (Woodard-USGS) W72-08102

MIXING ZONES.

Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, September 2,

Descriptors: *Water quality standards, *Waste dilution, *Mixing, *Water pollution control, *State Governments, Water Quality Act, Streams, Ecology, Fish, Wildlife, Aquatic life, Plankton, Environmental effects, Documentation, Water quality control.
Identifiers: *State regulations, *Water quality criteria.

Criteria for maintaining mixing zones are presented for individual State-adopted water quality standards. Mixing zones are areas which are unavoidably and harmfully polluted and which are allowed for mixing of the discharged waters with the receiving waters. They have defined and identifiable limits, and the waters outside of the zones must meet the standards for that particular body of water. The Water Quality Criteria report by the National Technical Advisory Committee recommends when several mixing zones are located close together that they lie on the same side of the stream to allow a continuous passageway for aquatic organisms on the opposite side. Mixing zones constitute barriers which can harmfully block the spawning migration of anadromous and catadromous species and damage the plankton organisms and aquatic invertebrates in the water flow. Adequate zones of passage (at least 75% of the cross-sectional stream area) must be maintained at all times for the fish, and adequate provision must be made for the survival of the drift organisms. Mixing zones cannot be considered a substitute for, or an extension of a

waste treatment facility. The Environmental Protection Agency supports these recommendations. (See also W72-08099) (Woodard-USGS) W72-08103

NITRATES

Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, November 1971.

Descriptors: *Water quality standards, *Nitrates, *Water pollution control, *State Governments, *Federal Government, Water Quality Act, Federal Government, Water Quality Act, Domestic water, Recreation facilities, Fish, Wildlife, Industrial wastes, Agricultural runoff, Ecology, Environmental effects, Documentation. Identifiers: *State regulations, *Water quality

Nitrate criteria limitations within individual Stateadopted water quality standards are presented. Nitrate standards are set to control the amount of nitrates discharged into the water as part of overall water quality control. The National Technical Advisory Committee in the report Water Quality Criteria limits nitrates in water as follows: The naturally occurring ratios and amounts of nitrogen (particularly NO3 and NH4) to total phosphorus should not be radically changed by artificial means. Phosphate levels in flowing streams should not exceed 100 micrograms/liter or more than 50 micrograms/liter where streams enter lakes or reservoirs. (See also W72-08099) (Woodard-W72-08104

MERCURY AND HEAVY METALS.

Environmental Protection Agency, Washington, D.C. Office of Water Programs

Environmental Protection Agency, Division of Water Quality Standards Report, May 1971. 11 p.

Descriptors: *Water quality standards, *Mercury, *Heavy metals, *Water pollution control, *State Governments, Federal Government, Water Quali-Y Act, Domestic water, Recreation facilities, Aquatic life, Ecology, Fish, Wildlife, Industrial wastes, Agriculture, Municipal water, Environmental effects, Documentation, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Zinc. Identifiers: *State regulations, *Water quality criteria, Silver.

Mercury and heavy metals criteria limitations within State-adopted water quality standards are presented. All states have been required to adopt statements as a part of general standards applicable to all waters which require that those waters be free of substances attributable to discharges or wastes which are toxic or which produce undesirable physiological responses in human, fish, and other animal life and plants. Heavy metals considered are cadmium, chromium, copper, iron, lead, manganese, silver, and zinc. (See also W72-08099) (Woodard-USGS) W72-08105

TEMPERATURE.

Environmental Protection Agency, Washington, D.C. Office of Water Programs

Environmental Protection Agency, Division of Water Quality Standards Report, March 1971. 16 D.

Descriptors: *Water quality standards, *Water Descriptors: "water quanty standards, "water temperature, "Water pollution control, "State Governments, "Federal Government, Thermal pollution, Water Quality Act, Domestic water, Recreation facilities, Ecology, Fish, Wildlife, Industrial wastes, Municipal water, Environmental effects, Documentation. Identifiers: *State regulations, *Water quality

Water temperature criteria limitations within in-dividual State-adopted water quality standards are presented. Water Quality Criteria (report by the National Technical Advisory Committee) used by EPA in evaluating State standards, recommends a maximum water temperature of 90 deg F with a maximum permissible rise above the naturally existing temperatures of 5 deg F in streams and 3 deg F in lakes. It recommends that trout and salmon waters not be warmed in order to protect these resources. Because of the lesser temperature fluctuations in the marine and estuarine environment. the NTAC report recommends that monthly maxfore the addition of artificial heat, not be raised by more than 4 deg F from September through May and by more than 1.5 deg F from June through August. (See also W72-08099) (Woodard-USGS) W72-08106 imum daily temperatures recorded at any site, be-

DISINFECTION.

Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, May 1971. 8 p.

Descriptors: *Water quality standards, *Disinfection, *Water treatment, *Water pollution control, *State Government, Federal Government, Water Quality Act, Domestic water, Recreation facili-ties, Bacteria, Ecology, Fish, Widlife, Industrial wastes, Coliforms, Municipal water, Agricultural runoff, Environmental effects, Documentation, Environmental sanitation, Chlorination.
Identifiers: *State regulations, *Water quality

Disinfection criteria within individual State-adopted water quality standards are presented. Disinfection is employed to protect public water supplies, primary- and secondary-body-contact recreational waters, shellfisheries (because oysters, clams, and mussels can accumulate microorganisms, including bacteria and viruses, and transmit them to consumers), and agricultural waters for domestic animals. Disinfection reduces the water-borne coliforms--organisms existing in feces, and other sources, used as indicators pathogen content in the disease-producing potential of water. Inadequately disinfected sewage can tai of water. Inadequately distillected sewage can contaminate receiving waters with Salmonella, Shigella, Escherichia coli, Leptospira, and Mycobacterium. Enteric viruses such as polio and hepatitis can also be present. (See also W72-08099) (Woodard-USGS) W72-08107

ANTIDEGRADATION.

Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Environmental Protection Agency, Division of Water Quality Standards Report, April 1972, 58 p.

Descriptors: *Water quality standards, *Degrada-tion (Stream), *Water pollution control, *State Governments, *Federal Government, Water Quality Act, Water quality control, Aquatic life, Ecology, Industrial wastes, Agricultural runoff, Municipal wastes, Domestic water, Environmental effects, Documentation.
Identifiers: *State regulations, Water quality

This is a compilation of all Federally approved water antidegradation statements adopted dividual States in response to a policy directive is-sued by the Secretary of the Interior on February 8, 1968. The purpose of antidegradation is to prohibit the deterioration of waters whose existing quality is higher than established water quality standards. At the time of this report, the following States did not have a Federally approved antidegradation statement: Alabama, Georgia, Mistacgracation statement: Ataoania, Georgia, ani-sissippi, and Tennessee. Action is underway in all the States to adopt an antidegradation provision in their water quality standards. (See also W72-08099) (Woodard-USGS) W72-08108

RECOVERY OF DIFFERENTIALLY PLACED NO3-N IN A SILT LOAM SOIL BY FIVE CROPS, Wisconsin Univ., Madison. Dept. of Horticulture; and Wisconsin Univ., Madison. Dept. of Soil

For primary bibliographic entry see Field 03F. W72-08123

PHOSPHORUS ADSORPTION SITES IN SOILS, Connecticut Agricultural Experiment Station, New Haven.

Soil Science Society of America Proceedings, Vol. 33, No. 4, p 630-632, July-August, 1969, 3 tab, 10

Descriptors: *Phosphorus, *Adsorption, Organic matter, Soil chemical properties, Anion exchange. Identifiers: Extractable phosphorus.

Regression analysis of phosphorus adsorption as a function of five soil characteristics indicates that organic matter is important in the initial bonding of phosphorus by soils. It is, therefore, proposed that phosphorus is initially bonded to anion exchange sites on organic matter, and subsequently trans-formed into less soluble iron and aluminum phosphates. (Skogerboe-Colorado State) W72-08126

DRAINAGE DESIGN FOR MANAGING SALINE

POLLUTANTS, Bureau of Reclamation, Denver, Colo.

R. J. Winger, Jr. Paper presented at 1969 Winter Meeting, American Society of Agricultural Engineers, December 9-12, 1969, Chicago, Illinois, Paper No. 69-735, 20 p. 4 fig, 4 tab, 7 ref.

Descriptors: *Drainage, *Drainage engineering, Drainage practices, Pollution, Water pollution, *Water pollution sources, Salts, Drainage systems, Tiles, Drainage water, Desaination, *Saline water.

Identifiers: *Donnan equation, Transient equa-

Management of the quality of subsurface drain effluent from irrigated lands in the Western United States can be accomplished by: (1) constructing deep, widely spaced subsurface pipe drains with pipe and lined collectors terminating at a desalting plant; (2) constructing shallow, closely a vaced subsurface pipe drains which skim off the better quality ground water, leaving the more saline ground water in storage. A drainage system design using transient and steady state methods, for determining drain spacings when salinity control is considered, is demonstrated by sample calculations. (Skogerboe-Colorado State) W72-08129

REMOVAL OF OIL FROM SEA WATER. AMF Beaird, Inc., Uncasville, Conn. For primary bibliographic entry see Field 05D. W72-08146

REGIONAL MANAGEMENT OF WASTE SYSTEMS-ONE STATE'S APPROACH, Maryland Environmental Service, Annapolis Thomas D. McKewen.

Paper presented at 44th Annual Conference of Water Pollution Control Federation, San Fran-cisco, California. October 1971, 12 p.

Descriptors: *Comprehensive planning, *River basin development, *Maryland, Multiple-Purpose projects, Cost sharing, Coordination, Administration, Solid wastes, Lejuid wastes, Legislation, Construction costs, Land use, Budgeting, Governments, Waste water treatment, *Water quality control, Treatment facilities.

The magnitude of the pollution control problem has been and is such that many state and local governments are losing functional control over environmental planning efforts mainly due to a lack of coordination. In Maryland, the Maryland Environmental Service was formed as a support group to the environmental protection effort. By becoming responsible for the various communi-ties, the Service can move across political, geo-graphical, and organizational boundaries to pro-vide both liquid and solid waste processing facili-ties. The Service has the course color vide both liquid and solid waste processing facilities. The Service has the power to plan, finance, construct, and operate treatment facilities, but local authorities retain control of waste collection systems, thereby establishing their own land use patterns. River basin and solid wastes plans must also be compatible with local land use. Services provided by the Service are on a wholesale basis to the local government, with the local government dealing directly with the customers. Rates set by the Service are intended to cover all costs attar dent to the provision of the Service with the ex-ception of planning. The Maryland Environmental of one state's answer to the need for efficient, in-novative, and flexible management for environ-mental quality problems. (Lowry-Texas)

URBAN STORM RUNOFF AND COMBINED SEWER OVERFLOW POLLUTION, SACRAMENTO, CALIFORNIA.

Envirogenics Co., El Monte, Calif. For primary bibliographic entry see Field 05D. W72-08160

WHOLESALING ENVIRONMENTAL SER-

Maryland Environmental Service, Annapolis. For primary bibliographic entry see Field 06E. W72-08161

SEPARATION OF LIQUID ORGANIC MATERIALS FROM SUBSTRATES, Dow Chemical Co., Midland, Mich. (Assignee).

D. H. Haigh.

U. S. Patent No. 3,520,806, 3 p, 3 tab, 4 ref; Official Gazette of the United States Patent Office Vol. 876, No. 3, p. 605, July 21, 1970.

Descriptors: *Patents, Water purification, *Liquid wastes, Organic compounds, Pollution abatement, "Water pollution treatment, Waste water treat-ment, Separation techniques, *Polymers, Oily water, Hydrocarbons, Oil spills, *Oil wastes, *Oil pollution.

A method is provided for separating organic liquids from substrates such as water by contacting the substrate and liquid with a cross-linked organic liquid-swellable, organic-insoluble polymer and then separating the polymer with the organic liquids imbled therein. (Sinha-OEIS) W72-08170

PROCESS AND APPARATUS FOR REMOVING FLOATING WASTES FROM WATER SUR-

FACES, For primary bibliographic entry see Field 05D. W72-08174

PROCESS FOR SEPARATION OF OIL FILMS

FROM WATER, Shell Oil Co., New York. (Assignee). For primary bibliographic entry see Field 05D. W72-08175

PROCESS OF TREATING ACID MINE WATER, Barnes and Tucker Co., Haverford, Pa. (As-For primary bibliographic entry see Field 05D. W72-08178

OCEAN AFFAIRS BIBLIOGRAPHY, A SELECTED LIST EMPHASIZING INTERNATIONAL LAW, POLITICS AND ECONOMICS OF OCEAN USES. For primary bibliographic entry see Field 06E. W72-08238

THE EFFECTS OF DIATOMS ON THE LAR-VICIDAL ACTIVITY OF DURSBAN, NOVEMBER 1969 - MARCH 1970, Army Environmental Hygiene Agency, Edgewood Arsenal, Md. For primary bibliographic entry see Field 05C. W72-08242

EFFECTIVENESS OF 9.9 PERCENT DURSBAN IN POLYETHYLENE APPLIED AS A PRE-SEASON LARVICIDE, FEBRUARY - APRIL

Army Environmental Hygiene Agency, Edgewood

1. A. Parker. Available from the National Technical Informa-tion Service as AD-725 573, \$3.00 in paper copy, \$0.95 in microfiche. Entomological Special Study No 31-005-71, 1970. 4 p, 2 ref, append.

Descriptors: *Larvicides, *Pesticides, *Insecticides, Mosquitoes, *Chemcontrol, Water pollution

Identifiers: *Dursban, O-O-diethyl-o- (3-5-6-trichloro-2 pyridyl) phosphothioate.

Twenty naturally occurring woodland pools were given a pre-season treatment while still ice covered, at rates of 0.5, 1.0, and 2.5 mg/l active incovered, at rates of 0.5, 1.0, and 2.5 mg/l active in-gredient (1.4, 2.7, and 6.8 lbs/acre, respectively) with polyethylene pellets containing 9.9% Dursban (O,O-diethyl-O- (3,5,6-trichloro-2-pyridyl) phosphorothioate). There were 5 pools in each group, one group being an untreated control. Lar-val populations of Aedes canadensis were reduced for 13 weeks at all dose rates. However, the treat-ment were not completely effective in all injections nor 13 weeks at an absertaces. However, the treat-ments were not completely effective in eliminating larvae from the pools, apparently due to the fact that the floating pellets were found primarily at the periphery of the pools where they lost contact with the water as it receded and were unable to mainthe water as it receded and were unable to main-tain residue levels. Each pool was sampled on a weekly basis by taking 5 random dips with an enameled dipper and recording the number of A. canadensis larvae. Simultaneously, a 10 ml water sample was collected from each pool for gas chro-matographic residue analysis, which showed an unknown environmental contaminant in the water. This unknown contaminant precluded accurate residue determinations. (Svensson-Washington) W72-08243

AN ECONOMIC ANALYSIS OF EROSION AND SEDIMENT CONTROL FOR WATERSHEDS UNDERGOING URBANIZATION, Dow Chemical Co., Midland, Mich. G. H. Brandt, E. S. Conyers, F. J. Lowes, J. W. Mighton, and J. W. Pollack. Available from the National Technical Informa-

ston Service as PB-209 212, \$3.00 in paper copy, \$0.95 in microfiche. Final Report, 1972. 181 p, 27 fig, 28 tab, 98 ref, append. OWRR C-1677 (No 3392) (1).

Descriptors: *Erosion control, *Sediment control, *Cost-benefit analysis, Benefits, Economics, Potomac River, Sediment yield, Sediment transport, Maryland, Systems analysis, *Urbanization, Construction, Evaluation. Identifiers: *Sediment damages, *Erosion and sediment control systems, *Seneca Creek

sediment control systems, watershed (Md).

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

Economic benefits are expected from controlling erosion and sediment during urban construction, but control costs have not been previously related to benefits. This study relates cost to effectiveness and damage values for many erosion and sediment and damage values for many erosion and secument control systems. The Seneca Creek watershed, near Washington, D.C., was used as a model. Estimated maximum soil erosion rates approach 200-ton/acre/year or 128,000 ton/sq. mile/year. Sediment damages from such uncontrolled erosion on urban construction sites in the Seneca watershed could potentially reach \$1,500/acre. Present control practice includes sediment basins, diversion berms, level spreaders, grade stabilization structures, sodded ditches, seeding and straw mulch tacked with asphalt or disked. The average conventional system is estimated to cost \$1,125/acre and to control 91% of the potential erosion. Consystems incorporating large sediment basins can boost control to 96% at less total cost. Multipurpose impoundments designed with sediment forebays for chemical flocculation can boost urban sediment control to 99%, AND, IN ADDI-TION, CONTRIBUTE SIGNIFICANTLY TO CONTROLLING SEDIMENT FROM OTHER LAND. Sediment from nonurban sources must be controlled to significantly reduce sediment pollu-W72-08246

ENVIRONMENTAL SIMULATION AND POLICY FORMULATION: METHODOLOGY AND EXAMPLE (WATER POLICY FOR BRITISH COLUMBIA), British Columbia Univ., Vancouver. Dept. of

British Columbia Univ., Vancouver. Dept. o Mathematical Ecology. For primary bibliographic entry see Field 06A. W72-08261

MATHEMATICAL MODELING OF ESTUARI-AL SYSTEMS, California Univ., Davis. Dept. of Civil Engineer-

For primary bibliographic entry see Field 06A.

W72-08264

MATHEMATICAL MODEL APPLICATIONS FOR WATER QUALITY MANAGEMENT IN THE POTOMAC ESTUARY, Environmental Protection Agency, Seattle, Wash.

Region X.
For primary bibliographic entry see Field 06A.
W72-08265

MODELLING TECHNIQUES FOR SITING LARGE THERMAL POWER PLANTS ON IN-DUSTRIALIZED ESTUARIES, Clemson Univ., Clemson, S.C. Dept. of Civil En-

gineering.
For primary bibliographic entry see Field 06A.
W72-08266

WASTE OIL RECOVERY UNIT,

E. Sharpton.
U. S. Patent No. 3,643,804, 3 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office Vol. 895, No. 4, p. 1364, February 22, 1972.

Descriptors: *Patents, Oil spills, *Oil pollution, Pollution abatement, *Water pollution treatment, Equipment, Separation techniques, Oil wastes.

An endless conveyor belt is mounted on the bow of a barge and projects downward and forward. The lower run of the belt can be positioned below the water/oil interface to assure maximum oil absorption with minimum water pickup. The oil pickup reservoir or sump has an outlet coupled to a suction pump for transferring oil to the main storage. (Sinha-OEIS) W72-08275

DEVICE FOR AERATING SEWAGE WATER, For primary bibliographic entry see Field 05D.

W72-08277

APPARATUS FOR CENTRIFUGALLY REMOV-ING LIQUID FROM A MIXTURE, For primary bibliographic entry see Field 05D. W72.08278

FLOATING OIL CONFINING APPARATUS, Ocean Pollution Control, Inc., Dallas, Tex. (Assignee). H. J. Fitzeerald.

U. S. Patent No. 3,641,770, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office Vol. 895, No. 3, p. 829, February 15, 1972.

Descriptors: *Patents, Oil spills, *Oil pollution, Equipment, Pollution abatement, *Water pollution treatment, Separation techniques, Waste water treatment, Water pollution control.

Elongated flexible hollow tubular float members are inflated to low pressure to maintain a high degree of flexibility. These are connected end to end in a ring which surrounds an area around the source of the oily material. Impermeable sheet material form skirts suspended from the float. The flexibility of the ring allows it to conform to wave motion and surface chop. A transfer pipe has an inlet at a level within the thickness of the oily accumulation. The pipe extends to a pump on a storage barge anchored adjacent to the ring to remove the oil as it accumulates. (Sinha-OEIS)

APPARATUS FOR CONFINING MATERIAL FLOATING ON WATER,

Susquehanna Corp., Fairfax, Va. (Assignee). T. E. Sladek, J. E. Palmer, and M. F. Steele. U. S. Patent No. 3,638,429, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office Vol. 895, No. 1, p. 57, February 1, 1972.

Descriptors: *Patents, Oil spills, *Oil pollution, Pollution abatement, Water pollution treatment, *Equipment, Separation techniques.

The floating barrier to confine oil spills utilizes floating segments that are linked together and surround the oil. Each segment comprises an upper and lower part. The upper is buoyant and floats, the lower is of neutral buoyancy providing ballast below the surface. A flexible restraint strap is secured to both sections to limit movement. The confined oil is prevented from moving over or under the floating segment. (Sinha-OEIS) W77-0828

OIL SKIMMING APPARATUS,

Ocean Pollution Control, Inc., Dallas, Tex. (Assignee). H. J. Fitzgerald.

U. S. Patent No. 3,523,611, 3 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office Vol 877, No 2, p 325, August 11, 1970.

Descriptors: *Patents, Oil spills, Equipment, Separation techniques, *Pollution abatement, Water pollution treatment, *Oil pollution, *Skimmine.

This device consists of a tapered funnel assembly having a cover of flexible sheet material. It can be towed by a single boat in a direction perpendicular to the wide end of the funnel. Portions of the cover ride upon the floating film of oil. The funnel has side skirts of similar flexible material. Their lower edges being attached to opposite edges of a bottom panel of netting which holds the skirts in proper downward position to confine the oil while permitting the water to pass through the bottom panel. The oil is channeled to a sump at the funnel apex. (Sinha-OEIS)

METHOD AND APPARATUS FOR CONTROLLING OXYGEN TRANSFER AND POWER REQUIREMENTS IN A WATER AERATION SYSTEM,

SYSTEM, Welles Products Corp., Roscoe, Ill. (Assignee). For primary bibliographic entry see Field 05D. W72-08296

ROLE OF ANIMAL WASTES IN AGRICUL-TURAL LAND RUNOFF.

North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.

For primary bibliographic entry see Field 05B.

CATTLE FEEDLOT WASTE PROBLEMS, Kansas State Univ., Manhattan. R. I. Lipper, J. R. Miner, and G. H. Larson. Paper presented at Oklahoma Cattle Feeders Seminar, February 2-3, 1967, Stillwater, Oklahoma. 9 p., 5 ref.

Descriptors: *Farm wastes, *Feed lots, Runoff, *Sprinkler irrigation, Water pollution, Cattle, *Kansas, Coliforns, Water reuse.
Identifiers: *Impounding.

Cattle feedlot runoff became recognized as a problem in Kansas during the late 1950's. Incidents of septic streams and fishkills were noted immediately following rainfall in areas where no known municipal of industrial waste discharges existed, and where chances of insecticide and herbicide residues seemed remote. To study feedlot runoff, two experimental feedlots were constructed. One was entirely surfaced with concrete; the other had concrete only around feed hunks. Rather than wait for natural storms, simulated rainfall was provided through six part-circle irrigation sprinklers spaced at the periphery of the lots. The first method for control of runoff to be studied involves impounding the runoff water until it can infiltrate adjacent land without producing further runoff. New animal research facilities are being planned at Kansas State University. Funds are being sought to incorporate research systems for processing total waste production from animals reared in several covered pens with concrete floors. Hopefully results will be used in setting standards for cattle feedlots. (Bundy-lowa State)

CHARACTERIZATION OF WASTE TREAT-MENT PROPERTIES OF PIG MANURE, Newcastle-upon-Tyne Univ. (England). Dept. of Agricultural Engineering. J. R. O'Callaghan, V. A. Dodd, P. A. J. O'Donoghue, and K. A. Pollock.

Journal Agriculture Engineering Research, Vol 16, No 4, p 399-419, December 1971. 13 fig, 15 tab, 8 ref.

Descriptors: *Farm wastes, *Hogs, Feeds, Biochemical oxygen demand, Chemical oxygen demand, Solid wastes, Hydrogen ion concentration, Nutrients, Phosphorus, Potassium, Confinement pens.

Identifiers: *Total solids, Volatile solids.

The daily faecal and urinary production from individual pigs were measured over the live-weight range 20-90 kg. Three different feeding regimes were employed. Faecal and urinary production can be expressed as a percentage of meal and water consumed; the values are influenced by feeding regime. The results from the study on individual pigs were, in general, confirmed by a trial carried out on groups of pigs. There was no significant difference in the quantity of manure produced by hogs and gilts. Feeding regime was found to influence significantly the major properties of pig manure. The properties studied included biochemical oxygen demand, chemical oxygen demand, total solids, volatile solids, pH and the major nutrient elements, nitrogen, phosphorus and

potassium. No significant reduction in either oxygen demand or volatile solids was achieved by storing the manure in dung channels for periods of up to 18 weeks. (Bundy-Iowa State)

WASTE MANAGEMENT FOR FEEDLOTS, Nebraska Univ., Lincoln. Coll. of Agriculture.

Extension Service Bulletin, E.C. 71-795, (1971). 14 p, 15 fig.

Descriptors: *Farm wastes, *Nebraska, Livestock, Runoff, *Feed lots, *Water pollution control, *Pollution abatement, Legal aspects.

Guidance and information are provided to help livestock producers develop facilities that will, by proper waste management, help prevent pollution. Careful selection of a new site for livestock production facilities can help reduce potential water and/or air pollution problems. Methods for controlling and managing waste runoff for existing or new lots are described. These techniques are based on results of recent research on waste management by USDA Agricultural Research Ser-vice personnel and the University of Nebraska. The Nebraska Water Pollution Control Act requires that programs to control livestock wastes be operational by December 13, 1972. (Bundy-Iowa State) W72-08305

LIMNOLOGICAL INVESTIGATIONS OF TEXAS IMPOUNDMENTS FOR WATER QUALITY MANAGEMENT PURPOSES, Texas Univ., Austin. Center for Research in Water

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E. G. Fruh, and E. M. Davis. Available from the National Technical Informa-tion Service as PB-209 216, \$3.00 in paper copy, \$0.95 in microfiche. Center for Research in Water Resources, Final Report, Publication No 87, 1972. 224 p, 76 fig, 32 tab, 8 append. OWRR B-020-TEX

Descriptors: Water quality control, *Limnology, *Dissolved oxygen, *Temperature, *Bacteria, *Nutrients, *Phytoplankton, Density stratification, Hypolimnion, Penstocks, Urban runoff, *Texas, *Impoundments, Colorado River. Identifiers: Highland Lakes.

The overall goal was to delineate the significant water quality changes which would occur upon transformation of Texas river systems into a contiguous series of slackwater pools. Bacterial data available from one impoundment since 1925 showed decreases following upstream impoundment construction and recent increases due to urban runoff. A simplified procedure for tempera-ture prediction in a stratified southwestern impoundment was developed using a combined net emergy transfer-diffusion approach. Primary emphasis was placed on the obtainment of valid data on the hypolimnetic dissolved oxygen sources and sinks for development and validation of a pre-diction model. The major sink was microbial respiration on the sinking epilimnetic phytoplank ton debris. Different nutrients were found to limit phytoplankton growth in various seasons. (Run-kles-Texas) W72-08307

SENATE, 86-0, BACKS MAJOR WATER POL-LUTION CONTROL BILL. For primary bibliographic entry see Field 06E. W72-08308

REPRESENTATIVES ABZUG AND RANGEL CRITIQUE OF WATER POLLUTION BILL IDENTIFIES ITS WEAKNESSES.
For primary bibliographic entry see Field 06E.

RESOLUTION OF MINNESOTA POLLUTION CONTROL AGENCY. For primary bibliographic entry see Field 06E.

INTERSTATE WATERS OF STATE OF ALABAMA; PROPOSED WATER QUALITY STANDARDS, Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 06E. W72-08311

AN ACT TO AUTHORIZE THE ARKANSAS POLLUTION CONTROL COMMISSION TO MAKE GRANTS TO ANY POLITICAL SUBDIVISION, TO PAY A PORTION OF THE COSTS OF WATER POLLUTION PROJECTS, AND FOR OTHER PURPOSES. For primary bibliographic entry see Field 06C. W72-08312

KAWAIHAE HARBOR FOR LIGHT-DRAFT VESSELS, HAWAII COUNTY, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div. For primary bibliographic entry see Field 08A. W72-08313

FEDERAL CONTROL OF WATER POLLU-TION: THE REFUSE ACT PERMIT PROGRAM, R. G. Hildreth. The Business Lawyer, Vol. 27, p. 567-579, January

1972, 79 ref.

Descriptors: *Rivers and Harbors Act, *Navigable waters, *Permits, *Waste disposal, *Pollution abatement, Sewage disposal, Effluents, Waste water (Pollution), Legal aspects, Legislation, Administrative agencies, Regulation, Federal govern-ment, Federal jurisdiction, Law enforcement, Penalties (Legal), Water law, Legal review, Fish conservation, Aquatic environment, Water quality control, Governmental interrelations, Water pollution control, Industrial wastes.

Identifiers: *Refuse Act, National Environmental Policy Act.

Pending comgressional enactment of a more com prehensive water pollution program, the Nixon Administration has instituted a permit program under the Rivers and Harbors Act of 1899, commonly known as the Refuse Act. The Act prohibits the discharge of refuse into navigable waters, with very few exceptions. Pursuant to Executive Order 11574 of 1970, the discharge of refuse into naviga-ble waters requires a permit from the Secretary of the Army and the concurrence of the Environmental Protection Agency (EPA). Corps of Engineer's regulations defining the types of discharges for which permits are required are discussed. Filing an application or receiving a permit does not prevent prosecution for previous discharges. The require-ments for issuance of a permit are explained, in-cluding: (1) state certification; (2) absence of objection by the EPA regional representative; (3) nonimpairment of anchorage and navigation; (4) no substantial adverse impact on fish and wildlife; (5) public notice and hearing; and (6) compliance with procedures under the National Environmental Policy Act, as to impacts on other than water quality. Duration, revocation, and other terms and conditions of permits are briefly discussed. (Grant-Florida) W72-08314

INTERSTATE ENVIRONMENT COMPACT.
Committee on Public Works (U. S. Senate). Subcommittee on Air and Water Pollution.

Hearings - 92d Congress, 2nd Session, January 24, 1972. 101 p, 27 ref.

Descriptors: "United States, "Interstate compacts, "Water pollution control, "Federal jurisdiction, "Supervisory control (Power), Water resources development, State governments, Water policy, Water law, Interstate rivers, Interstate commissions, Legislation, Governmental interrelations, Federal government, Water quality control, Legal aspects, Regional development, Decision making, Constitutional law, Regulation, Administrative agencies, Jurisdiction, State jurisdiction.

The management of pollution problems must often be undertaken on an interstate basis. Congress is presently considering legislation to grant its preconsent to a general interstate environment compact. The Governor of West Virginia testified in support of the legislation of basis for the No. compact. The Governor of West Virginia testified in support of the legislation on behalf of the National Governors' Conference. The most contentious issue in the proposed legislation concerns the provision whereby Congress would delegate compact-making authority to the states to allow supplementary agreements without specific congressional approval. Spokesmen for the Environmental Protection Agency, the Friends of the Earth, and the Sierra Club criticized this provision as a congressional abandonment of the constitutional responsibility to review all interstate compacts. These groups contended some type of limited federal review is needed to ensure that such compacts are woven into the fabric of national programs. The text of the proposed legislation, portions of a National Water Commission report, a Nader study group report, and other materials are included in the record. (Brackins-Florida) W72-08315

ZERO DISCHARGE: NATIONAL GOAL OR NATIONAL CALAMITY,
Department of Commerce, Washington, D.C.

J. T. Conner. Congressional Record, Vol. 118, No. 10, p. E638-640 (daily ed.) January 31, 1972.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Waste disposal, *Economic feasibility, *Water pollution control, Legislation, Water pollution, Water quality stan-Legistation, water poliution, water quality standards, Costs, Economic justification, Project feasibility, Legal aspects, Cost allocation, Waste treatment, Water quality, Technology, Research and development, Political aspects.

Identifiers: *Zero discharge.

An address by Commerce Secretary Connor, delivered on January 6 to the Synthetic Organic Chemical Manufactures Association, was inserted into the Record by Representative Dorn. The Muskie Bill creating a zero discharge goal for 1985 will be economically damaging. That damage will far outweigh beneficial effects. While effluent limitations are desirable, the Muskie Bill is 'flying blind'-it commits the Nation without knowing the cost. The House bill is preferred because it will provide information before action is taken. One negative aspect of the Muskie plan requires municipalities to build waste treatment plants in 1974 using the 'best available technology' and to conform those to the best technology again in 1979. using the 'best available technology' and to conform those to the best technology again in 1979. The cost of implementing zero discharge ranges from \$35-billion to \$3-trillion. One consequence of implementation would be drastically higher taxes and higher prices. Passage of the Muskie Bill would creat a credibility gap when the government is unable to implement it. The Bill's damaging aspects require full public discussion. The goal should not be zero discharge. Instead, water quality should be maintained at a level allowing recreational use and acquatic life support. In view of other tional use and aquatic life support. In view of other social priorities, excessive amounts should not be spent on water purity. (Ilkson-Florida) W72-08319

ENVIRONMENTAL AWAKENING-MESSAGE FROM THE PRESIDENT OF THE UNITED STATES, For primary bibliographic entry see Field 06E. W72-08321

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

NATIONAL ENVIRONMENTAL CENTER ACT OF 1972, Congress, Was Washington, D.C Washington, D.C.; and House,

For primary bibliographic entry see Field 06E. W72-08323

PLANNING AND ZONING--LAND SUBDIVI-

For primary bibliographic entry see Field 06E.

COMMISSION. WATER IMPROVEMENT WATER IMPROVEMENT COMMISSIONDEFINITIONS, WASTE DISCHARGE LICENSES, APPLICATIONS FOR LICENSES, APPEALS, DISCHARGE OF OIL PROHIBITED,
CERTAIN DEPOSITS AND DISCHARGES
PROHIBITED.
For primary bibliographic entry see Field 06E.

W72-08326

WASTE WATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR NASSAU AND SUFFOLK COUNTIES, NEW YORK (DRAF ENVIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, New For primary bibliographic entry see Field 05D. W72-08335

LEAD-DEADWOOD SANITARY DISTRICT NO.
1, SOUTH DAKOTA, PROJECT NO. WPC SD200 (DRAFT ENVIRONMENTAL IMPACT

STATEMENT). Environmental Protection Agency, Denver, Colo. For primary bibliographic entry see Field 05D. W72-08337

A BILL TO PROVIDE FOR THE REGULATION OF GROUND WATERS WITHIN THE UNITED STATES AND THE SUBSURFACE DISPOSAL OF WASTES.

For primary bibliographic entry see Field 06E. W72-08347

WATER QUALITY PROTECTION FOR IN-LAND LAKES IN WISCONSIN: A COM-PREHENSIVE APPROACH TO WATER POLLU-

Wisconsin Univ., Madison. School of Natural Resources.

Wisconsin Law Review, Vol. 1970, p. 35-78. 193 ref.

Descriptors: *Wisconsin, *Lake basins, *Land use, "Water pollution control, "Water quality control, Water pollution sources, Water pollution effects, Sedimentation, Runoff, Surface runoff, Agricultural runoff, Urban runoff, Watersheds (Basins), Eutrophication, Legal aspects, Constitu-tional law, State jurisdiction, Land tenure, Ripari-an waters, Legislation, Lake shores, Lakes, Zon-

Identifiers: *Land use controls.

The deterioration of inland lakes through water pollution, eutrophication, and sedimentation poses serious legal and technical challenges. Such pollution is created either directly or indirectly by ru-noff. The use of land use regulation to control in-direct pollution is discussed. Land use control is inhibited, however, by technical and legal restraints which do not interfere with direct pollution control. Wisconsin's shoreland zoning statute is analyzed in a case study. Basically, all land and water use around lakes is controlled by integrated state and local regulations to preserve water quality and shoreland amenity. Problems such as formulating model regulations, the lack of resource data, and the lack of adequate technical alterna-tives are considered. Pollution control provisions in a model ordinance are discussed. Wisconsin's shoreland program is criticized for: (1) excluding several indirect pollution sources from regulation, (2) severely limiting development controls, (3) an inadequate land and water use control plan, and (4) a lack of scientific study from which to develop programs. Land use controls will play a more im-portant part in controlling pollution, but only affirmative action can maintain water quality. (Grant-Florida) W72-08349

REFLECTIONS ON BRUSSELS: IMCO AND THE 1969 POLLUTION CONVENTIONS, D. M. O'Connell.

Cornell International Law Journal, Vol. 3, No. 2, p. 161-188, 1970, 141 ref.

Descriptors: *Oil pollution, *Water pollution control, *Treaties, *International law, *Law of the sea, Water pollution, Water quality control, Jurisdiction, Legal aspects, Oceans, International waters, Pollutants, Water law, Foreign countries, United Nations, Governments, Insurance, Ships, Foreign trade, Regulation, Penalties (Legal), Negligence.
Identifiers: *Inter-Governmental Maritime Con-

sultative Organization, *1969 Brussels Con-ference, Coastal waters, Strict liability.

At the 1969 Brussels Conference two conventions were adopted by 54 participating nations: (1) the Public Law Convention, and (2) the Civil Liability Convention. Traditionally, establishment and enforcement of maritime pollution measures have been vested in the state of the ship's flag. The Public Law Convention, however, provided concurrent jurisdiction for aggrieved coastal states; but the extension of coastal state authority was carefully hedged with restrictions, such as requiring consultation with the flag state, and sanctions for overreaction. The Civil Liability Convention for overreaction. Inc Civil Llaunity Convention attempted to establish uniform international procedures for determining oil pollution liability and compensation. Strict liability, rather than absolute liability or negligence, was the standard imposed. The limitation of liability provision was one of the most controversial provisions adopted. A major weakness of the Brussels Conference was its failure to encompass non-oil pollutants. Moreover, to control ship pollutants, the Inter-Governmental Maritime Consultative Organiza-tion (IMCO) should endorse stricter standards and take on greater authority as an investigative body. (Brackins-Florida)

THE PRESIDENT'S 1971 ENVIRONMENTAL PROGRAM.

Council on Environmental Quality, Washington.

For primary bibliographic entry see Field 06E. W72-08352

MINEWATER TREATMENT-INCO SUDBURY

DISTRICT OPERATIONS, International Nickel Co. of Canada Ltd., Sudbury (Ontario). Mining and Smelting Div. For primary bibliographic entry see Field 05D. W72-08355

EQUITABLE SHARING OF MUNICIPAL WASTE TREATMENT COSTS-TECHNICAL CONSIDERATIONS, Chrysler Corp., Detroit, Mich.

A. R. Balden

Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 16, No. 2, October 6, 1971, San Francisco, California,

Descriptors: *Municipal wastes, Grants, *Legislation, *Industrial wastes, *Financing, Regulation, Water Quality Act, Cost analysis, Biochemical oxygen demand, Suspended solids, Water pollution control, *Waste water treatment, *Cost sharing. Identifiers: *Sewer charges.

Current legislation provides financial assistance to small municipalities who wish to build wastewate treatment plants, but cannot afford them. However, industries are not eligible for such assistance, and since it is a well-recognized fact that larger, more centralized facilities are usually more economical than each industry having its own treatment plant, some formula is needed for charging the industries for treatment of their wastes in a municipal facility. The Environmental Protection Agency has developed such a formula, namely: C1 = VoVi + boBi + SoSi, where Vo = unit cost of transport and treatment chargeable to BOD (5/bb), So = unit cost of treatment chargeable to suspended solids (5/lb), and Vi, Bi, Si = the discharge volume, weight of BOD in Current legislation provides financial assistance to chargeable to suspended solids (3/lb), and Vi, Bi, Si = the discharge volume, weight of BOD in lbs/year, and weight of suspended solids in lbs/year, respectively. However, the suggestion has been made to modify the equations such that Bi and Si would be only that amount in excess of such materials normally in municipal wastes, to avoid multiple costs. Finally, direct supervision and enforcement of the formula should revert to the state, with the withdrawall of all federal results. the state, with the withdrawal of all federal regulatory personnel, except when requested to assist. This would eliminate the multiplicity of effort and its associated pyramiding costs. (Lowry-Texas)

EAST BAY MUD IS KNEE-DEEP IN PLANS. For primary bibliographic entry see Field 05D. W72-08362

COST OF INDUSTRIAL AND MUNICIPAL WASTE TREATMENT IN THE MAUMEE RIVER BASIN, Enjay Chemical Co., Baytown, Tex.

J. V. Matson, and G. F. Bennett. Chemical Engineering Progress Symposium Series No. 97, Vol 65, p 100-105, 1969, 1 fig, 3 tab, 10 ref.

Descriptors: River basin development, *Industrial wastes, *Municipal wastes, Planning, *Water purification, Tertiary treatment, Aesthetics, *Cost analysis, *Benefit-cost ratio, Industrial water, Potable water, Waste water treatment, Ohio, Indiana, Michigan. Identifiers: *Maumee River basin.

An analysis was made of the current situation of the Maumee River Basin, with the study revealing that all major tributaries and streams were suffering from gross pollutional loads from either cities or industries. Water usage for any purpose was essentially impracticable. The river basin was then analyzed with respect to the tangible benefits which could be realized by restoring the waters to good quality. The principal beneficiaries of cleaner waters would be: (1) municipal water systems; (2) domestic users; (3) industrial users; (4) recreational users; (5) esthetic enjoyment; (6) thermoelectric power generation; (7) navigation; (8) hydroelectric power; and (9) commercial fisheries. Total cost for secondary treatment of all locations plus tertiary treatment at some locations as well as phosphorus removal would be \$14,288,000. Total benefits accrued from increased municipal, domestic, industrial, and recreational water usage, as well as esthetic benefits would be \$13,707,000, or a benefits/cost ratio of 0.96. By demonstrating the economic attractiveness, it was hoped that some added incentive for the drive against pollution in the Maumee area will be stimulated. (Low-

REGULATORY APPROACH TO CONTROL OF HEAVY METAL DISCHARGES, Tennessee Water Quality Control Board, Nash-

ville.

S. L. Jones.

Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 10, No. 4, October 5, 1971, San Francisco, California.

Descriptors: Water quality control, Legislation, *Regulation, *Tennessee, Laboratories, Monitoring, On-site investigations, *Heavy metals, Toxicity, Lethal limit, Public health, *Legal aspects, Discharge (Water), Effluents, *Pollution abate-

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The Tennessee Water Quality Control Board has attempted to build as much inner flexibility into their regulatory functions as possible. The basic reasoning behind the desire for flexibility is that their regulatory functions as possible. The obasic reasoning behind the desire for flexibility is that just as no two pollution problems are identical, no two pollution problem solutions will be identical either. In addition, pollution abatement by elimination of heavy metals discharges must be a cooperative effort between the regulators and the regulated in order for any least cost or optimal solutions to be implemented. The new Tennessee Water Quality Act of 1971 covers all discharges of materials that affect the quality and use of the water. In the event that pollution is discovered and the owner refuses to start steps leading to correction, legal action can be initiated almost immediately. By backing up the laboratory investigations with co-operative discussions of various problems, while still maintaining legal regulatory powers, the Tennessee Water Quality Control Board personnel hope to make pollution abatement as inexpensive and as rational as possible. ment as inexpensive and as rational as possible. (Lowry-Texas) W72-08377

EVALUATION OF NITRIFICATION IN STREAMS--CLOSURE, Michigan Univ., Ann Arbor. Dept. of Environmental Health. For primary bibliographic entry see Field 05B. W72-08381

HIGH TEMPERATURE ENVIRONMENT EF-FECTS ON GESTATING SWINE, Oklahoma Agricultural Experiment Station, Still-G. W. A. Mahoney, I. T. Omtvedt, D. F. Stephens, E. J. Turman, and R. Edwards.

Paper presented at Annual Meeting of the Southwest Region, American Society of Agricultural Engineers, April 3-5, 1968, Baton Rouge, Louisiana, 14 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Farm wastes, Confinement pens, *Swine, Ventilation, Cooling, *Temperature, *Environmental control. Identifiers: *Slotted floor, Farrowing, Control

The objectives were to investigate the effect of high ambient temperatures on swine prior to breeding and during gestation on the estrual cycle, conception rate and subsequent embryo survival; to attempt to determine the 'critical' periods of temperature stress prior to breeding and during gestation for subsequent testing; and to evaluate the performance of the environmental chambers constructed for this study. There was a definite tendency toward reduced corpora lutea, fewer viable embryo, lower survival rates and smaller embryos for the gilts in the heat stress chamber. The differences were significant (p < 0.05) for reduced viable embryo and survival rates for gilts stressed The objectives were to investigate the effect of viable embryo and survival rates for gilts stressed 1-15 days postbreeding. Rectal temperatures were significantly higher for gilts in the heat chamber. Also, six gilts, of the 32 in Trials 1 and 11, died due to heat prostration. The environmental chambers performed satisfactorily but needs some modification and improved instrumentation and controls. Humidity controls are needed so effects of environment with various high humidities and temperatures can be investigated. Present modifica-tions of the heating system are currently in progress and should result in better control of high temperatures and result in more uniform tempera ture, rather than the present 6 degrees variation, or plus or minus 3 degrees above and below 102 degrees F. (Bundy-lowa State)

HOW ENVIRONMENTAL PROBLEMS AFFECT FARM EQUIPMENT DESIGN, Sperry Rand Corp., New Holland, Pa. R. M. Alverson. Agricultural Engineering, p 20-22, January 1971. 3

Descriptors: Farm wastes, Fertilizers, Odor, Runoff, Nutrients, Equipment, *Design, *Pollution abalement, *Environmental effects, *Farm equipment, Agriculture. Identifiers: *Spreaders, Environmental trends.

The two most prevalent environmental trends in the U.S. today are the demands for 'clean' water and 'pure' air. These trends have been precipitated by both federal and state legislation. The Water Quality Act of 1965 (Public Law 89-234) was the first major federal legislation to force states to set minimum water quality standards and it established the Federal Water Pollution Control Administration. Future design consideration will include environmental quality concepts such as noise and vibration reduction and increased aesthetics. Future machines must also meet legal requirements for environmental protection. Design engineers should consider the trends of the Design engineers should consider the trends of the environmental movement in every country where their products are sold. Legal rulings, if not aesthetic values alone, may soon require that farm equipment and procedures be non-polluting. For example, spreading manure on frozen or snow-covered ground causes a potential water pollution hazard. Odor problems with manure spreading are also prevalent. When manure is spread on the land, it may become mandatory to incorporate it into the soil. Fertilizer spreaders, pesticide applicators and tillage implements also create unwanted sources of nutrients, toxic chemicals and sediment. The environmental effects of these sediment. The environmental effects of these machines must be considered in their design. (Bundy-Iowa State) W72-08392

INVESTIGATION OF MATERIALS AND METHODS FOR USE IN REMOVING SURFACE LAYERS OF OIL ON WATER, Army Engineer Waterways Experiment Station, Vicksburg, Miss. P. Houston

B. J. Houston.

Available from NTIS, Springfield, Va. 22151 as AD-732 221, \$3.00 paper copy, 95 cents microfiche. Miscellaneous Paper C-68-5, Sep-tember 1968. 18 p. 2 fig, 13 ref.

Descriptors: *Water pollution sources, *Oil spills, Oil pollution, "Water pollution control, Reviews, Methodology, Oceans, Bays, Oil-water interfaces, Oily water, Testing.

Identifiers: "Oil-spill removal.

Oil pollution caused by spillage of oily contaminants on the seas is a problem that has become progressively more acute as more and larger shipprogressively more acute as more and larger ship-ments of petroleum and petroleum products are made. The breakup of the supertanker TORREY CANYON off the French and English coasts, spilling over 100,000 tons of crude oil, and of the smaller OCEAN EAGLE in San Juan Harbor, Puerto Rico, spilling 6,000,000 gal of oil, dra-matized the seriousness of the problem. This pro-cram identified by a literature search and corgram identified by a literature search and corgram identified by a interature search and cor-respondence, materials and methods which offer potential solutions to pollution problems resulting from oil spillage. All methods deemed worthwhile were compiled. Samples of silicone-treated fly ash, tested in England following the TORREY CANYON disaster, were tested to determine their effectiveness in absorbing and sinking oil. Two similar samples made in the United States were also tested, as were samples of high-absorptive swelling clays and a synthetic silica. Some labora-tory burning tests were conducted to evaluate methods of burning oil on water. Floating and sinking oil-absorbent materials have definite possispills. (Woodard-USGS)
W72-08423

MICROBIOLOGICAL AND CHEMICAL ANALYSES OF TILE LINE DRAINAGE WATERS AND DEPOSITS IN IMPERIAL VALLEY, CALIF, California Univ., Riverside. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W72-08453

PROCESS CONTROL MODEL FOR OXYGEN REGENERATION OF POLLUTED RIVERS,

REGENERATION OF POLLUTED RIVERS, PHASE III. Rutgers - The State Univ., New Brunswick, N. J. Coll. of Engineering. B. Davidson. New Jersey Water Resources Research Institute, Technical Completion Report, April 1972. 4 p. OWRR B-031-N.J. (1).

Descriptors: *Systems analysis, Water quality control, *Optimization, Water purification, Water pollution treatment, Biochemical oxygen demand, Dissolved oxygen, *Model studies, Oxygenation, Effluent streams, *Control systems.

Identifiers: *Effluent distribution, *Process control models, *Oxygen regeneration.

Optimal control theory based on Pontryagin's minimum principle has been applied to the problem of specifying the best combination of minimum percent BOD waste treatment and effluent distribution policies for a single plant on a specified polluted river segment. The analysis features a new dual water quality stream standard consisting of a minimum allowable dissolved oxygen concentration at every point in the river segment. ygen concentration at every point in the river seg-ment combined with a maximum allowable BOD concentration at a specified downstream point. The optimal BOD effluent distribution policies are compared with choice sub-optimal effluent discharge patterns associated with best single point, best uniform, and best bang-bang injection policies. The inequality constraints, the nonlineari-ties in the system model, and the synthesis of the optimal controls were handled in a direct manner using the Pontryagin control theory principle, combined with gradient search and penalty function techniques. The results of the study very definitely established certain guidelines for increasing the assimilative capacity of a given river segment through judicious combinations of minimum percent BOD waste treatment and con-tinuous BOD effluent distribution or dumping pat-terns associated with single plant effluents. The systems analysis was made tractable by incorporating a no short-circuit constraint into the dumping policies. (See also W71-03015 and W71-10162) (Whipple-Rutgers) W72-08455

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

MODELS FOR MANAGING METROPOLITAN SURFACE WATER SYSTEMS, Cornell Univ., Ithaca, N. Y. Water Resources and

Marine Sciences Center.

J. R. Fergusson, and D. P. Loucks.

Available from the National Technical Information Service as PB-209 209, PC \$3.00 in paper copy, MF \$0.95 in microfiche. Studies in the Analyesis of Metropolitan Water Resource Systems, Vol. IV, Technical Report No. 40, February, 1972. 219 p. 15 fig, 6 tab, 92 ref. OWRR C-1640 (No 3151) (4).

Descriptors: *Surface waters, *Systems analysis, *Linear programming, *Water quality, *Flood control, *Stochastic processes, Optimization, Dissolved oxygen, Reservoir operation, Simulation analysis, Mathematical models, Waste water treatment Flood superpartition, Ontimus development ment, Flow augmentation, Optimum development plans, *Model studies.

Field 06—WATER RESOURCES PLANNING

Group 6A—Techniques of Planning

This volume is the fourth of a sequence of studies utilizing optimization and simulation techniques to analyze a variety of metropolitan water resource problems. Some preliminary models are developed for managing the surface water resources of metropolitan regions. Some linear or separable programming models are described for defining and analyzing alternative investment and operating policies for regulating and allocating metropolitan surface water supplies and for the reduction of flood damages. Surface water quality management models for rivers, lakes and estuaries are reviewed. The purpose of this chapter is primarily one of model development. In both chapters political as well as economic aspects of each management objective are discussed. A state-of-the-art report on models for the control of flood flows and reduction of flood damages is included. Of primary concern is the development of methods for optimally operating multi-flood control storage systems during periods of flood flow. Four main problem areas are discussed, and a survey of published research relating to each area is presented. (Campbell-Cornell)

CHANCE CONSTRAINED RESERVOIR

MODEL, Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics. For primary bibliographic entry see Field 03F. W72-07907

MATHEMATICAL PROGRAMMING FOR RE-GIONAL WATER QUALITY MANAGEMENT, California Univ., Los Angeles. School of Business. For primary bibliographic entry see Field 05G.

ANALYSIS OF THE FEASIBILITY OF INTERIM

W72-07998

WATER SUPPLIES, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 06B. W72-07999

WATERSHED MANAGEMENT: A SYSTEMS APPROACH, Harvard Univ., Cambridge, Mass. Div. of En-

Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.

For primary bibliographic entry see Field 04D.

GROUNDWATER FLOW SYSTEM ANALYSIS IN LAKE ENVIRONMENTS, WITH MANAGE-MENT AND PLANNING IMPLICATIONS, Wisconsin Univ., Madison. Water Resources Management Program.

For primary bibliographic entry see Field 02F.
W72-08052

THE STATE OF THE ART IN OPTIMAL CON-JUNCTIVE USE OF GROUND AND SURFACE WATER SYSTEMS, California Univ., Los Angeles, Dept. of Engineer-

ing Systems.
For primary bibliographic entry see Field 04B.
W72-08247

THE OBJECTIVE FUNCTIONS OF WATER RESOURCES SYSTEMS ANALYSIS,

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. W. A. Hall.

Paper presented at La Planificacion del Uso de los Recursos Hidraulicos en Chile, Santiago, September 20-24, 1971. Universidad de Chile, Departmento de Industrias Publicacion No 71/15/C. 15 p.

Descriptors: *Systems analysis, Water resources, *Mathematical models, Alternative planning,

Decision making, Political aspects, *Model studies.

Peculiar characteristics of water resources systems are discussed as they relate to developing mathematical models for the analysis of optimum sets of decisions for water resources planning, design, and operations. It is concluded that the objectives of water resources development are basically political in character, not pervasively engineering and economic in nature. Furthermore, water resources development constitutes a complex interaction of objectives, many of which are non-commensurate and unquantifiable-unsuitable to a useful mathematical model which seeks to meet the true objectives of the decision process. Too many planners choose objectives to maximize the completion of their models rather than modeling those objectives which can be applied inteligently and realistically to a proposed or existing water system. Discussed are examples of reasonable and unreasonable objectives, and five basic mathematical approaches to selection of possible optimum values are presented. Systems analysis is useful as a guide and can provide the substantial framework in which to examine and select objectives. Its models must be constructed to eliminate large numbers of alternatives which by some logic or criterion can be shown to be less than optimal. (Bell-Cornell)

FURTHER STUDIES OF THE OPTIMUM OPERATION OF DESALTING PLANTS AS A SUPPLEMENTAL SOURCE OF FIRM YIELD, Utah State Univ., Logan. Coll. of Engineering. For primary bibliographic entry see Field 03A. W72-08253

COMPUTER ANALYSIS OF WATER DISTRIBUTION SYSTEMS: PART II - NUMERICAL SOLUTION, Medical Univ. of South Carolina, Charleston. Dept. of Biometry. For primary bibliographic entry see Field 04A. W72-08254

CONTROL OF HYDROLOGIC SYSTEMS FOR MULTIPLE USES IN A CLOSED-LOOP FRAMEWORK, Arizona Univ., Tucson. Dept. of Systems En-

Arizona Univ., Tucson. Dept. of Systems Engineering.
For primary bibliographic entry see Field 04A.
W72-08255

OPTIMAL IRRIGATION QUANTITY AND FREQUENCY, Hawaii Univ., Honolulu. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 03F. W72-08256

MODELLING TECHNIQUES IN WATER RESOURCES SYSTEMS.

In: Proceedings (Vol. 1), (1972) International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. A. K. Biswas, editor. Canada Dept. of the Environment. 239 p.

Descriptors: *Model studies, *Mathematical models, *Computers, *Planning, *Management, *Decision making, *Simulation analysis, *Systems analysis.

The application of modelling techniques to water resources policy planning and decision making is of comparatively recent origin. Since the first computer simulation of a simplified river basin in 1962, there has been great progress in the field. This Symposium brings together scientists from all disciplines, and from both the academic and the practical world, to try to solve the communication

problem. In this first volume, fifteen articles present various aspects of current model studies. Conceptual and stochastic models are discussed, also simulations of salmon migration, eelgrass cycles, and spatial distribution patterns. Locating power plants, environmental policy formulation, and water quality parameters in the Great Lakes are covered in the light of the new techniques. (See W72-08259 thru W72-08272) (Campbell-Cornell) W72-08258

ECOLOGICAL MODELS: A STATUS REPORT, British Columbia Univ., Vancouver. Inst. of Animal Resources and Ecology. C. S. Holling.

In: Proceedings (Vol. 1), International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 3-20, 3 fig, 21 ref.

Descriptors: *Ecology, *Simulation analysis, *Model studies, *Computers, *Mathematical models, *Planning, Management, Methodology.

A state-of-the-art paper on ecology is best presented as a personal view because of the dramatic changes in the last five years. Two notable developments are: 1. The emergence of computer simulation models of complex ecological systems, able to explore the consequences of man's intervention, and 2. A view of ecological stability that provides a new rationale for the planning process and forces new views of old problems by shifting attention from symptoms to causes. Two distinct approaches to ecological modelling are: The compartment approach where the emphasis is on ecosystems, and the components approach which concentrates on the analysis of ecological processes, linking them to simulate population interactions. These recent developments in modelling bridge a gap between the experimental and the conceptual. The development will continue and provide useful resource management tools. But there are still serious gaps inhibiting the process from research to policy implementation. (See also W72-08258) (Campbell-Cornell)

DIGITAL SIMULATION OF THE UPSTREAM MOVEMENT OF MIGRATORY SALMONIDS, Water Resources Board, Reading (England). P. J. Radford, J. C. Peters, and H. R. Farmer. In: Proceedings (Vol. 1), International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972, p 21-38, 5 fig, 1 tab, 9

Descriptors: "Mathematical models, "Salmon, "Fisheries, "Fish migration, "River flow, "Rivers, "Simulation analysis, "Seasonal, Management, Water supply, Dynamic programming, Estuaries. Identifiers: England, Britain, Lune River, Leven River, Coquet River.

To protect salmon resources it is necessary to understand the relationship between salmon migration and river flows. The synthesis and manipulation of simulation models of such systems is facilitated by recent developments in mathematical model buildings. The formulation and evaluation of a model (simulation language CSMP) designed to simulate the upstream migration of adult salmonids are described. Modelling possible causal chains within the system makes it possible to account for a large proportion of the variance with daily rate of migration over the whole season by utilizing only river flow data. This model can also demonstrate the probable effects of changes in river management, where conflicts arise between the requirements of fisheries and of water supply. (See also W72-08258) (Campbell-Cornell) W72-08260

ENVIRONMENTAL SIMULATION AND POLICY FORMULATION: METHODOLOGY AND

Techniques of Planning-Group 6A

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EXAMPLE (WATER POLICY FOR BRITISH COLUMBIA), British Columbia Univ., Vancouver. Dept. of Mathematical Ecology. J. Kane, W. Thompson, and I. Vertinsky. In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 39-55. 4 fig, 7 tab.

Descriptors: *Mathematical models, *Computer models, *Decision making, *Simulation analysis, *Water policy, *Export, *Canada, *Environment, *Methodology, *Forecasting, Model studies, Economics. Identifiers: *Sensitivity analysis, *DELPHI.

In environmental problems, mathematical and comp. ter models are often constructed to aid decision making. But they tend to be excessively numerical, while mental mc.dels overemphasize intuitive images. To combine the advantages of both kinds of models, a simulation language is presented. It was developed as an aid to a DEL-PHI procedure which enables all experts involved to share information and judgments, while eliminating the pitfalls of group discussions. The use of the DELPHI-simulation procedure is demonstrated through the formulation of water policy for British Columbia. For fifty simulated years, results are presented for basic simulation (no water export) and three simulations with intervention (varying amounts of export, etc.). Senvention (varying amounts of export, etc.). Sensitivity analysis takes into account such 'soft variables' as Canadian sovereignty. (See also W72-08258) (Campbell-Cornell)

THE USE OF MODELS IN PRACTICAL RESOURCE MANAGEMENT, Montreal Engineering Co. Ltd. (Quebec). R. C. Zimmermann.

In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 56-64.

Descriptors: *Model studies, *Resources, *Methodology, *Management, *Lobsters, *Fisheries, *Bays, *Tidal powerplants, *Reservoir storage, *Grazing, *Irrigation, *Atlantic salmon, *Costs, Simulation analysis, Planning. Identifiers: New Brunswick.

Modelling techniques, and especially broad resource models in which water is only one of many components, have not been in use long enough to thoroughly evaluate. But there are a number of resource problems that might clearly benefit from modelling. Examples are the lobster fishery in a bay impounded by a tidal power scheme, the downstream effects of a storage reservoir on a river and the scheduling of plant. reservoir on a river, and the scheduling of planting, irrigation, and grazing in undeveloped countries. A threatened resource like the New Brunswick Atlantic salmon fishery might also profit from modelling and simulation which could detect the most sensitive management interventions. The greatest practical problem with models is their high cost, along with the psychological disad-vantage of a client's distrust and lack of un-derstanding of the methodology. (See also W72-08258) (Campbell-Cornell) W72-08262

SIMULATION OF THE ANNUAL ECOLOGI-CAL CYCLE OF BENTHIC MARINE PLANTS--EELGRASS IN IZEMBER LA3-00N, ALASKA, Brigham Young Univ., Provo, Utah. Dept. of Civil

Engineering.
L. B. Merritt, and C. P. McRoy.
In: Proceedings (Vol. 1), International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972, p 65-77. 6 fig, 4 ref.

Descriptors: "Plant populations, "Plant growth, "Biomass, "Computer models, "Tides, "Natural resources, "Management, "Radiation, "Photosynthesis, "Simulation analysis, Coastal

marshes, Food webs, Temperature, Environmen-tal effects, *Alaska. Identifiers: *Izembek Lagoon, Bering Sea, Seagrass, Benthic marine plant, Zostera marina, *Eelgrass, Isolation.

A computerized model was developed to simulate eelgrass growth cycles in Izembek Lagoon. Seagrasses have long been recognized as an important resource, but few studies have dealt with the tant resource, but few studies have dealt with the quantitative measurements necessary for understanding the environmental response of eelgrass in natural settings. The data used (1967 values) are: daily isolation, daily tide times and heights, and Bering Sea surface temperatures. The model is structured so that beginning biomass, total daily radiation, saturation radiation level for photosynthesis, tidepool depth, photosynthetic growth rate, extinction coefficient, and loss rates can be changed for any run to allow observation of the effect of changes in these key environmental parameters. Computer time is 30 seconds for a one-year simulation. (See also W72-08258) (Campbell-Cornell)

MATHEMATICAL MODELING OF ESTUARI-

AL SYSTEMS, California Univ., Davis. Dept. of Civil Engineer-G. T. Orlob.

In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 78-128, 15 fig, 1 tab, 38

Descriptors: *Mathematical models, Water resources, *Water quality, Tidal waters, Discharge (Water), *Estuaries, *Estuarine environment, Simulation analysis, Dimensions, *Model studies, Bays.
Identifiers: *Delaware model (DECS), Bay-Delta

models.

Predicting the effects of proposed changes in the estuarial regime, the most highly complex environmental system, has always been a challenge to water resource analysts. With the development of the one dimensional steady state Delaware (DECS) model in the mid-60's, mathematical modeling became available to handle the problem. Other models followed, and now the technique has reached the level where it is possible to obtain reliable predictions of tidal velocities, discharges, and tidal elevations for shallow, vertically mixed estuaries. The Bay-Delta models provided simulation of both the hydrodynamic and quality behavior of shallow estuaries and embayments. Masch and Leendertse developed a two dimen-Masch and Leendertse developed a two dimensional approach. The need now is to develop three dimensional techniques to deal with water quality problems of deeper estuaries. (See also W72-08258) (Campbell-Cornell) W72-08264

MATHEMATICAL MODEL APPLICATIONS FOR WATER QUALITY MANAGEMENT IN THE POTOMAC ESTUARY, Environmental Protection Agency, Seattle, Wash.

K. D. Feigner, and N. A. Jaworski.
In: Proceedings (Vol. 1), International Symposium
on Modelling Techniques in Water Resource
Systems, May 9-12, 1972, p 129-138, 5 fig, 10 ref.

Descriptors: *Mathematical models, *Estuaries, *Water resources, *Water supply, *Water quality control, *Waste water, *Simulation analysis, Wastes, Salinity, Cycles, Seasonal, Planning, Nitrogen, Phosphorous, Hydrodynamics, Oxygen demand, Tides, Time, *Model studies.

Identifiers: *Potomac River, *Potomac Estuary.

Application of mathematical modelling techniques was an integral part of a 1969 study on the upper Potomac Estuary. This water resource-water supply study used the models to investigate alter-

native water quality and waste water management plans. Two different approaches were used: a time-varying non-tidal model (to simulate annual and seasonal cycles of nitrogen and phosphorous levels) and a real-time hydrodynamic-water quality model (to simulate the dissolved oxygen budget). The model was also used to determine allowable waste loads for ultimate oxygen demand, total nitrogen, and total phosphorous for various zones of the estuary. Salinity distributions caused by projected increased use as a water supply source were also predicted with the model. (See also W72-08258) (Campbell-Cornell) W72-08265

MODELLING TECHNIQUES FOR SITING LARGE THERMAL POWER PLANTS ON IN-DUSTRIALIZED ESTUARIES, Clemson Univ., Clemson, S.C. Dept. of Civil En-

gineering.

B. L. Edge, and B. C. Dysart.
In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 139-149, 6 fig, 9 ref.

Descriptors: "Mathematical models, "Simulation analysis, "Environment, "Thermal pollution, "Thermal power plants, "Estuaries, "Industrial wastes, "Water quality, "Sites, Methodology, Powerplants.

A technique has been developed adapting existing mathematical models to evaluate the environmen-tal impact of locating thermal power plants at al-ternate potential sites on an estuary. Such location studies must consider not only thermal pollution but the total effect of the complex interaction between the thermal discharges and other wastes from urban and industrial sources. The developed simulation techniques were applied to a straight-forward, one-dimensional example, which demon-strated the water quality response to a heated discharge at alternative sites. This methodology can be used by an environmental regulation agency as well as power industry personnel. (See also W72-08258) (Campbell-Cornell)

MULTI-LAYERED MODELS OF CURRENTS, TEMPERATURE, AND WATER QUALITY
PARAMETERS IN THE GREAT LAKES,
Department of Energy, Mines and Resources,
Burlington (Ontario). Canada Centre for Inland

In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 150-159, 2 fig, 6 ref.

Descriptors: *Mathematical models, *Canada, *Lake Ontario, *Water pollution control, *Lakes, *Computers, *Great Lakes, Currents (Water), Temperature, Dispersion, Atmosphere, Stratification, *Model studies, Advection, Diffusion, Inland waterways.

For optimum pollution control of large lakes it is necessary to acquire and develop basic knowledge of the character and behavior of their systems. Mathematical modelling techniques are used more and more by the wide variety of disciplines involved in such study. The Canada Centre for In-land Waters has designed a modelling program to describe the three-dimensional distribution of currents, temperature, and foreign matter in the Great Lakes. The basic principles underlying the computation of the transport of a quasi-conservative parameter by advection and diffusion are outlined. parameter by advection and diffusion are outlined. Also the dispersion of a pollutant in Lake Ontario is traced. The multi-layered model of a stratified lake developed at the Centre is described. This modelling program of the Great Lakes follows closely in the footsteps of the numerical models of the atmosphere. (See also W72-08258) (Campbell-Cornell) Cornell) W72-08267

Field 06-WATER RESOURCES PLANNING

Group 6A-Techniques of Planning

COMPUTER SIMULATION OF SPATIAL DIS-

TRIBUTION PATTERNS, Auckland Univ. (New Zealand). Dept. of Zoology. R. M. Cassie.

In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 160-170, 7 fig, 7 ref.

Descriptors: *Mathematical models, *Simulation analysis, Computers, *Distribution patterns, Biota, Environment, *Model studies, *Spatial distribution, Poisson ratio, *Stochastic process.

Computer simulation techniques are well-known as methods for estimating the parameters of otherwise intractible numerical systems. Two-dimensional pictures of the distribution of biota under various hypothetical pattern-generating situations are presented. Distributions simulated are: the random (Poisson) distribution; negative and positive contagion; random distribution modified by an environmental gradient; centric cluster formation; and the decay of a centric cluster to a random dis-tribution. It is demonstrated that neither contagion nor aggregation are necessary to produce over-dispersion. The models are produced by a highspeed printer graph-plotting routine. (See also W72-08258) (Campbell-Cornell) W72-08268

MATHEMATICAL MODELS OF HYDROLOGIC

SYSTEMS, University Coll., (Ireland). Dept. of Civil En-

gineering, Dublin (Ireland).
J. C. I. Dooge.
In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 171-189, 14 ref.

Descriptors: *Mathematical models, resources, *Hydrology, *Hydrologic systems, Methodology, *Model studies, *Linear pro-Methodology, *Model studies, *I gramming, Stochastic processes.
Identifiers: Deterministic components.

It is important to remember that in water resources development a model is something to be used rather than something to be believed, and must al-ways be regarded as a tool. What has been accom-plished and what remains to be done in the mathematical modelling of hydrologic systems is discussed. The type of national methodology required in the use of hydrologic models is outlined, diverse techniques are discussed, and ways to apply research findings to practical problems are recommended. The complementary nature of the deterministic and stochastic components of a hydrologic model is discussed. The basic unity underlying apparently different formulations of linear models is pointed out. (See also W72-08258) (Campbell-Cornell) W72-08269

RUNHYDROGRAPHS-A NEW CONCEPT ON HYDROGRAPH GENERATION, Natal Univ., Durban (South Africa), Dept. of Civil

Engineering.

L. A. V. Hiemstra In: Proceedings (Vol. 1), International Symposium on Modeling Techniques in Water Resources Systems, May 9-12, 1972, p 205-214, 4 fig, 2 tab.

Descriptors: *Model studies, *Hydrographs, *Ru-noff, *Floods, *Flood data, *Streamflow, *River flow, *Seasonal, Rainfall-runoff relationships. Identifiers: *South Africa, *Vaal River, *Runhydrographs.

There are three shortcomings in the usual analysis of extreme flood peaks. One is that only a very small part of one streamflow record is used; another is disregard of the seasonal cycle in streamflow; lastly, the pooling of all extreme floods disregards their magnitudes. These limita-tions were overcome when Run Theory was applied to thirty years of continuous streamflow records of the Vaal River at Standerton. This resulted in a family of curves which allowed the generation of hydrographs with any desired proba-bility of occurrence. These 'Runhydrographers' are easy to visualize; they define peak riverflow rates and their return periods in a new way, and they incorporate the seasonal cycle in the deriva-tion of extreme flood hydrographs. They may also provide a useful link in rainfall-runoff relations. (See also W72-08258) (Campbell-Cornell)

CONCEPTUAL MODELS FOR THE TRANSFORMATION OF PRECIPITATION INTO

Societe Grenobloise d'Etudes et Applications Hydrauliques, Grenoble (France). J. M. Dujardin.

In: Proceedings (Vol. 1), International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972, p 215-226.

Descriptors: *Mathematical models. *Computer Descriptors: *Mathematical models, *Computer models, *Rainfall-runoff relationships, Basins, *Floods, *Hydrologic data, Hydrologic cycle, *Runoff, Meteoric water, Infiltration, Evaporation, Flood forecasting, *Model studies. Identifiers: PREVIK model, BILIK model, France, Grenoble, Guadalquivir River (Spain), Creuse River (France), Rio Parana (Argentina).

To study the rainfall-runoff transformation fund tion of the elementary basin, SOGREAH developed two kinds of rainfall computer models. Priority was given to the development of hydrological mathematical models of the conceptual type. In the PREVIK model (a runoff model), only the meteoric water runoff stage is considered so as to set up a rational equation for the stormflood transfer. Infiltration and evaporation are both considered as losses and the general effect of these losses is allowed for by a subtractive parameter or a runoff coefficient. It is suitable for flood study and forecasting. The BILIK model (a hydraulic balance model) more exactly reproduces the physical reality of hydraulic exchange and water infiltration. It is suitable for simulating the hydrologic cycle of a river. Three examples of applications of these models are given. (See also W72-08258) (Campbell-Cornell) W72-08271

SOME APPLICATIONS OF STOCHASTIC HYDROLOGICAL MODELS, Imperial Coll. of Science and Technology, London (England). Dept. of Engineering Hydrology. T. O'Donnell, M. J. Hall, and P. E. O'Connell In: Proceedings (Vol. 1), International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 227-239, 4 fig, 12 ref.

Descriptors: *Stochastic processes, *Mathematical models, *Hydrologic data, Engineering, *Headwaters, *Reservoirs, *Flow system, *Flood frequency, *Floods, *Model studies, Hydrometry, Engineering personnel, Application methods. Identifiers: River Swincombe, *River Dart (England), *River Vardar (Yugoslavia).

Summaries are presented of two projects: 1. An investigation into the effect of a reservoir in the headwaters on the flow regime of the River Dart, and 2. A flood magnitude frequency study of the River Vardar. These two studies show how the choice of an appropriate stochastic model is governed by both the objectives of the investiga-tion and the available data. (See also W72-08258) (Campbell-Cornell) W72-08272

6B. Evaluation Process

MODELS FOR MANAGING METROPOLITAN SURFACE WATER SYSTEMS,
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center. For primary bibliographic entry see Field 06A. W72-07996

ANALYSIS OF THE FEASIBILITY OF INTERIM

WATER SUPPLIES,
California Univ., Riverside. Dept. of Soil Science
and Agricultural Engineering.
W. A. Hall, Y. Y. Haimes, and W. S. Butcher.
Water Resources Research, Vol. 8, No. 2, p 317325, April 1972. 3 fig, 2 tab, 4 ref.

Descriptors: *Water supply, *Cost analysis, *Desalinization, Economic feasibility, Mathematical models, Systems analysis, Hydraulic engineering, Water requirements, Optimization, Brackish water. Sea water. Groundwater. Aqueducts.

Complementarity is shown to exist between a relatively low average unit cost aqueduct-reservoir system and a relatively high average cost interim system such as a desalinization plant. The cost effectiveness of a combined desalting-surface supply system is discussed and a numerical examis presented. A table relating the different costs of the interim and long-term projects with the water requirement is presented. The surface system provides long-term, perpetuity advantages while the short-term desalting system yields more flexibility for the interim reassessment of needs and growth trends. Numerical results show that for a water requirement generally increasing over time, the conjunctive use of an interim desalinization supply and a deferred aqueduct surface system will be less costly in the long run than either system alone. (Bell-Cornell) W72-07999

WATER RESOURCES DEVELOPMENT IN IL-LINOIS

Corps of Engineers, Chicago, Ill. North Central For primary bibliographic entry see Field 04A.

AN ECONOMIC ANALYSIS OF EROSION AND SEDIMENT CONTROL FOR WATERSHEDS UNDERGOING URBANIZATION, Dow Chemical Co., Midland, Mich. For primary bibliographic entry see Field 05G. W72-08246

THE STATE OF THE ART IN OPTIMAL CONJUNCTIVE USE OF GROUND AND SURFACE WATER SYSTEMS, California Univ., Los Angeles, Dept. of Engineer-

ing Systems. For primary bibliographic entry see Field 04B. W72-08247

THE OBJECTIVE FUNCTIONS OF WATER RESOURCES SYSTEMS ANALYSIS, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 06A. W72-08248

MODELLING TECHNIQUES IN WATER RESOURCES SYSTEMS. For primary bibliographic entry see Field 06A. W72-08258

AN AESTHETIC OVERVIEW OF THE ROLE OF WATER IN THE LANDSCAPE, California Univ., Berkeley. Dept. of Landscape

R. B. Litton, Jr., R. J. Tetlow, J. Sorensen, and R.

A. Beatty.

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A. Vailable from the National Technical Information Service as PB-207 315, \$6.00 in paper copy, \$0.95 in microfiche. National Water Commission, Final Report NWC-EES-72-035, July 1971, 332 p, 92 fig, 196 ref, 4 append. NWC 70-032.

Descriptors: Aesthetics, *Environmental effects, *Water utilization, Landscaping, *Land use, *Recreation.

Identifiers: *Water use planning, *Scenic resources, *Natural environment.

resources, *Natural environment.

The aesthetic aspects of fresh water in the landscape are emphasized. The contributions of water to the environments of recreation and everyday life are explored. To identify the values of water in this role, a classification framework is developed for native characteristics and these are considered together with man-made changes. Concentrating upon the visual landscape, the classification identifies landscape units, setting units, and waterscape units. Inventories of existing conditions as well as man-made elements and improvements are related to the characteristics of the units. The scope includes evaluation comparisons and suggests tangible ways in which water and its treatment can contribute to environmental quality. Also included are recommendations for needed policies, planning guidelines and research that should better promote environmental enhancement through relationships with fresh water streams and bodies. The study is based on literature review and a synthesis provided by the design art of landscape architecture. (NWC)

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

INTERDISTRICT APPORTIONMENT OF FLOOD CONTROL COSTS, lowa Univ., lowa City. Dept. of Civil Engineering. For primary bibliographic entry see Field 04A. W72-08121

HANDLING WATER BY COMPUTER, Salt River Project, Phoenix, Ariz. For primary bibliographic entry see Field 03F. W72-08128

AN ACT TO AUTHORIZE THE ARKANSAS POLLUTION CONTROL COMMISSION TO MAKE GRANTS TO ANY POLITICAL SUBDIVISION, TO PAY A PORTION OF THE COSTS OF WATER POLLUTION PROJECTS, AND FOR OTHER PURPOSES.

Acts 108, 544, Acts of Arkansas, p. 294-304, 1187-1188, 1971.

Descriptors: *Arkansas, *Federal Water Pollution Control Act, *Legislation, *Construction costs, Sewage, Sewage treatment, Administrative agen-cies, Costs, Repayment contracts, Cost sharing, Cost allocation, Project planning, Bond issues, Financing, Water pollution control, Environmen-tal sanitation.

when any political subdivision of Arkansas applies for federal aid for construction of water pollution control projects under the Federal Water Pollution Control Act it also may apply to the Arkansas Pollution Control Commission for a state grant of aid. The statute limits aid to those projects which would treat, stabilize, or hold untreated or inadequately treated sewage or other waste. The state will pay the balance, not to exceed 25%, of the project cost after federal and local contributions. The Commission is authorized to issue revenue bonds to provide funds to make the state grants. The bonds are to mature not beyond forty years and may bear interest not exceeding 8% per annum. The political subdivision must obligate itself to levy and collect a 'Water Quality Control Charge' to meet the debt service requirements on any bonds to be issued by the commission. Other sections of the Act delineate the technicalities of issuance, procedures to be followed, and other implementation provisions. (Nielsen-Florida) W72-08312

ZERO DISCHARGE: NATIONAL GOAL OR NATIONAL CALAMITY,
Department of Commerce, Washington, D.C.

For primary bibliographic entry see Field 05G. W72-08319

EQUITABLE SHARING OF MUNICIPAL WASTE TREATMENT COSTS-TECHNICAL CONSIDERATIONS, Chrysler Corp., Detroit, Mich. Fos primary bibliographic entry see Field 05G. W72-08361

COST OF INDUSTRIAL AND MUNICIPAL WASTE TREATMENT IN THE MAUMEE RIVER BASIN, Enjay Chemical Co., Baytown, Tex. For primary bibliographic entry see Field 05G. W72-08372

6D. Water Demand

AVAILABILITY AND USE OF WATER IN NEBRASKA, 1970, Geological Survey, Lincoln, Neb. F. B. Shaffer. Nebraska Water Survey Paper No 31, March 1972. 67 p, 23 fig, 12 tab, 2 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Nebraska, *Water supply, Water users, Water quality, Hydrologic data, Data collections, Precipitation (Atmospheric), Evaporation, Streamflow, Runoff, Irrigation, Municipal water, Domestic water, Industrial water, Water yield, Annual, Water storage, Reservoirs.

The environmental conditions under which water occurs in Nebraska are described, the annual increments to the stored supply are evaluated, and the uses made of water resources for water year 1970 (October 1, 1969 to September 30, 1970) are summarized. About 5.3 million acre-feet (2.3 milsummarized. About 3.3 million acre-feet (2.3 million acre-feet of surface water and 3.0 million acre-feet more than in 1964. This increase was due largely to greater use of groundwater. Reservoir losses were an estimated 1.1 million acre-feet, which is five times the estimated value for 1964. Use of water supplied by municipalities averaged 187.9 mgd, an increase of 12 mgd over 1964, and water for rural domestic and livestock use was water for rural domestic and investice use we setimated at 121 mgd, an increase of 21 mgd over 1964. Self-supplied industries used 101 mgd, a 150% increase over 1964. Water use totaled about 14.8 billion gallons per day (16.5 million acre-feet) in water year 1970 for the state of Nebraska. (Woodard-USGS) W72-08409

6E. Water Law and Institutions

JONES V. TENNESSEE CENTRAL RY. (RAIL-ROAD'S LIABILITY FOR CAUSING AD-JACENT FARM TO FLOOD). 8 Tenn. App. 183-194 (1928).

Descriptors: *Tennessee, *Railroads, *Surface runoff, *Easements, Drainage, Damages, Adjudication procedure, Culverts, Ditches, Obstruction to flow, Legal aspects, Judicial decisions, Riddance (Legal aspects), Floods, Overflow, Rain, Storms, Water inity.

Plaintiff farmowner sued defendant railroad to recover flood damages. Defendant's right-of-way was adjacent to plaintiff's farm. When defendant's culverts and ditches became clogged, surface water overflowed plaintiff's land. Defendant claimed a prescriptive easement because the condition had existed for over 20 years without suit by plaintiff. However, the Tennessee Court of Appeal determined that defendant had maintained the drainage facilities until recently, thereby acknowledging plaintiff's right to adequate drainage. Hence, the court held that no prescriptive easement was acquired Defendant also contended that plaintiff's injury resulted from an un-

precedented rainfall, but it was determined that plaintiff's premises had been overflowed several times prior to that rainfall. Defendant also contended the verdict for damages was excessive. EXTENSIVE TESTIMONY WAS PRESENTED FOR PLAINTIFF, EACH WITNESS EXPRESSING HIS OPINION OF 'RESONABLE DAMAGES' FOR PLAINTIFF'S INJURY. The court held the testimony invaded the province of the jury and remaded for a new trial on the issue of the measure of damages. (Hart-Florida) W72-07931

HUTTON V. CLEVELAND, C., C. AND ST. L. RY (RAILROAD'S LIABILITY FOR CYTY'S NEGLIGENCE). 259 111. App. 23-27 (1930).

Descriptors: "Illinois, "Railroads, "Cities, "Surface runoff, Drainage, Culverts, Sewers, Adjudication procedure, Legal aspects, Judicial decisions, Floods, Drainage engineering, Pipes, Storm

Plaintiff hotel owner sued to recover damages for diversion of surface water by defendant railroad. Defendant's railroad embankment had a 24-inch culvert through it, but it discharged into the city's culvert which was only 15 inches in diameter. There was testimony at trial clearly showing that There was testimony at trial clearly showing that plaintiff's property was flooded because the city sewer became choked and would not accept the water coming through defendant's culvert. Accordingly, the Illinois Appellate Court found as a fact that the city sewer obstruction caused plaintiff's injury, and plaintiff failed to prove that defendant was negligent. Hence the lower court's decision for plaintiff was reversed. (Hart-Florida) W72-07932

CEAN POLITICS AT THE UNITED NATIONS, Department of the Interior, Washington, D.C. H. M. Dole, and D. P. Stang. Oregon Law Review, Vol. 50, p. 378-397, Spring 1971. 19 ref.

Descriptors: *United Nations, *Law of the sea, *International law, *Oceans, *Political aspects, Beds, Continental shelf, Continental margin, Exploitation, Exploration, Legal aspects, Navigation, Technology, Oceanography, Marine fisheries, Mineralogy, Mining, Marine geology, Foreign Identifiers: *Territorial waters

Recent United Nations resolutions on seabeds are reviewed, and conflicting national interests are discussed. A dramatic change in the prospects for developing a set of legal principles for ocean use occurred when, on May 23, 1970, President Nixon announced a policy favoring equitable sharing of seabed wealth among nations. The work of the 25th General Assembly is reviewed, including resolutions on legal principles of ocean use, establishing an international regime, and expansion of the Seabeds Committee. Conflicts between coastal and landlocked states and developed and underdeveloped coastal states are likely to dominate the 1973 Law of the Sea Conference. Other problems discussed include regulation of navigation and the rights of 'innocent passage', the extent of territorial waters and rights, mining, and oceanographic research. Organizational and political problems in the United Nations Conference are discussed. National objectives involved in the Recent United Nations resolutions on seabeds are cal problems in the United Nations Conference are discussed. National objectives involved in the Conference include developing mineral and fishing resources of continental margins, improving navigation, and protecting the marine environment. It is concluded that a new law of the sea convention is still a long way off. (Grant-Florida) W72-08022

GREAT LAKES STATES' PHOSPHORUS-DETERGENT LEGISLATION: STATUS REPORT, STATE LEGISLATURES ACT ON BILLS TO

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Field 06—WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

PROTECT SHORE AND WATERS OF LAKES.

The Great Lakes News Letter, Vol. 16, No. 2, p. 2-3, November-December 1971.

*Legislation, Phosphorus compounds, Indiana, New York, Min-Losphorus compounds, Indiana, New York, Minnesota, Michigan, Nutrients, Water quality, Water law, Legal aspects, State governments, Eutrophication, Regulation, Illinois, Ohio, Pennsylvania, Wisconsin, Waste treatment, Penalties (Legal), Water quality control.

States and municipalities around the Great Lakes are engaged in the construction of advanced waste treatment plants to curtail excessive nutrient enrichment of lakes and rivers. Furthermore, four states enacted legislation during 1971 to restrict phosphate levels in detergents. Indiana, New York, and Michigan set specific statutory limits on the amount of phosphorus allowed in detergents. Indiana has an eventual 3% limit on phosporus weight, Michigan an 8.7% limit, and New York will allow only trace elements. Minnesota, however, empowers the State Pollution Control Agency to set standards for all nutrients contained in detergents. The Michigan Act nullifies several mudetergents. The Michigan Act nullifies several mu-nicipal ordinances which would have banned phosphates entirely. Illinois, Ohio, and Pennsyl-vania are considering bills which will limit phosphorus in detergents by weight, and Wiscon-sin is considering a bill which would prohibit the sale and use of detergents containing phosphates after December 31, 1973. (Brackins-Florida) W72-08024

AN ACT TO RATIFY THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS-OKLAHOMA, 1970, AND TO SET FORTH THE PROVISIONS OF SAID COMPACT.

Act 16, Acts of Arkansas, p. 9-23, (1971).

Descriptors: *Arkansas, *Interstate compacts, *Interstate commissions, *Oklahoma, *Water allocation (Policy), Watercourses (Legal aspects), River basin commissions, Water resources development, Water resources, Water utilization, Interstate rivers, Legislation, Water law, Legal aspects, Administrative agencies, Administration, Adoption of practices, Reservoir storage, Pollu-tion abatement, State governments, Water quality control, Coordination.
Identifiers: *Arkansas River Basin Compact.

Arkansas hereby ratifies the Arkansas River Basin Compact, under which Arkansas and Oklahoma apportion the waters of the Arkansas River Basin. Specific allocations are set forth for each state. Any depletion of annual yield in excess of that allowed shall be delivered to the downstream state. Each state may construct, own, and operate water storage reservoirs in the other state, but any depletion in annual yield of any sub-basin of the Arkansas River Basin caused by the operation of a water storage reservoir constructed by a state or the United States shall be charged against the state in which that yield is utilized. Each state shall have the right to utilize any natural stream in the Basin to convey water from a reservoir. Both states agree to joint efforts to investigate and abate pol-lution through an active pollution abatement pro-gram. An interstate administrative agency is created for Compact administration. Powers and duties of the administrative commission are set forth. (Brackins-Florida) W72-08025

ANNUAL REPORT 1971.
Delaware River Basin Commission, Trenton, N.J.

(1971), 24 p, 36 photo, 2 dwg, 2 tab.

Pescriptors: *River basin development, *Delaware River Basin Commission, *Water supply development, *Comprehensive planning,

Delaware, Interstate commissions, Alternate planning, Groundwater resources, Multiple-purpose projects, Potential water supply, Project purposes, Regional development, Water supply, Water utilization, Surface water availability, Water storage, River basins, Interstate rivers, Maryland, New Jersey, New York, River basin commissions, Water quality control.

The Delaware River Basin Commission was created to manage regional water-related resources in the public interest and conserve and protect environmental values for future genera-tions. The Commission's policies, activities, and progress toward those goals are described. Major efforts were directed toward accommodation of future water supply needs, approval of the Basin's first multiple-purpose reservoir, and issuance of pollution abatement orders. The Commission's attentions were also concentrated on reducing substantially the volume of metals and other inorganic contaminants being dumped into streams and incontaminants being dumped into streams and col-creasing the number of systems for regional col-lection and treatment of wastes in heavily lection and treatment of wastes in heavily developed subregions. During the year, 83 public facilities were added to the Basin's comprehensive plan. One hundred proposals, including piers, dikes and docks, and industrial waste facilities were also cleared. Conforming with the National Environmental Policy Act, the Commission adopted a broad set of rules requiring sponsors of all water-related projects to supply full details on environmental effects and imposing on the staff broadened project review responsibilities. (Blank-Florida) Florida)

UNITED STATES V. 62.57 ACRES OF LAND IN YUMA COUNTY, ARIZONA (OWNERSHIP OF LANDS CREATED BY ACCRETION FROM SHIFTS IN RIVER COURSES).
449 F.2d 5-11 (9th Cir. 1971).

Descriptors: *Arizona, *Accretion (Legal aspects), *Public lands, *Colorado River, Legal aspects, Judicial decisions, Rivers, Navigable rivers, Riparian rights, Riparian land, River flow, Banks, Watercourses (Legal aspects), Boundaries (Property), Channel flow, Avulsion, Thalweg, Federal government, Meanders.

Plaintiff United States sued to determine title to certain lands on the west bank of the Colorado River in Yuma County, Arizona. Defendant occupants of the land claimed title as successors in interest to the original patentees on the theory that certain of the original patent land was now on the west bank due to an eastward shift in the course of the river. Plaintiff contended that at the time Arizona entered the Union the patented land was wholly on the east bank of the river and that the subsequent movement of the river to the east did not convey the accretion to the west bank to defendants' predecessor. The Ninth Circuit Court of Appeals held that where a patent was described in relation to a meridian, and not in relation to a river bank, shifts in the course of the river made no difference. The court also held that technical misnomers would not invalidate the patent so long as the description of the lands was sufficient. The court ruled that accretions to the west bank, within the area described by the patent, belonged to the defendants or their predecessors. (Grant-Florida) W72-08027

REMARKS OF HON, JOHN DINGELL TO CON-FERENCE ON ENVIRONMENTAL LAW. Congress, Washington, D.C.; and House, Washington, D.C.

Congressional Record, Vol. 118, No. 28, p. E1678-1681 (daily ed.) february 28, 1972.

Descriptors: *Pollution abatement. *Governmental interrelations, *Project planning, *Environ-mental effects, Planning, Legislation, Political aspects, Federal government, Economic justification, Economic impact, Water pollution sources, Decision making, Economics, Social impact, Water pollution control, Public health, Water resources development, Legal aspects. Identifiers: *National Environmental Policy Act.

The speech by Congressman Dingell to the Second Annual Conference on Environmental Law was introduced into the Record by Representative Pelly. Congressman Dingell discussed the results of a recent study made by the Club of Rome showing that through either exhaustion of resources or extreme pollution the present social system will collapse by the 2020. Faced with such a prediction we must seek solutions to present and future environmental problems. The National Environmental problems are proposed to the control of the vironmental problems. The National Environmental Policy Act is a major tool to be used in solving the pollution problem. The mandate of NEPA is that it shall be the policy of the federal government to provide a decent and wholesome environment for every American. The policies of NEPA must be entwined with the organic laws of every federal agency, thereby forcing a detailed consideration of the environmental impact of every government project. NEPA not only requires a consideration of environmental effects, but it also requires that economic impact, including economic losses caused by pollution. Carefull attention must also be given to other goals of the Nation throughout the planning stages of each project. (Horwitz-Florida) full scale consideration be given to a project's W72-08028

WATER QUALITY STANDARDS-ADOPTION, IDENTIFICATION, AND AVAILABILITY OF STATE STANDARDS, Environmental Protection Agency, Washington,

D.C. For primary bibliographic entry see Field 05G. W72-08029

WETLANDS-ZONING.

Maine Rev. Stat. Ann. tit. 12, Subsections 4751 thru 4758 (Supp. 1972). 2 p.

Descriptors: *Wetlands, *Land use, *Maine, *Water resources development, Non-structural alternatives, Water zoning, Legislation, Regulation, State governments, Legal aspects, Water law, Water policy, Penalties (Legal), Eminent domain, Administration, Water pollution, Dredging, Administrative agencies, Adoption of practices, Administrative decisions, Zoning.

The Wetlands Control Board is herein authorized to promulgate orders regulating, restricting, or prohibiting dredging, filling, removing or otherwise altering any coastal wetlands, or draining or depositing sanitary sewage into or on any coastal wetlands. Before taking such action the Board must give notice and provide a public hearing. Such orders shall be recorded in the registry of deeds for the county in which such wetlands are located. Under appeal procedures herein set forth, a court may enter a decree that such orders shall not apply to specified areas. No person may petition for the assessment of damages by reason of the adoption of an order. The Board is also authorized to take wetlands by eminent domain proceedings. Violations of orders of the Board be punished by fines of not more than \$500. The Superior Court shall have jurisdiction to restrain a continuing violation of any such order or provision of this legislation. (Brackins-Florida) W72-08030

RIVER STATES CONCERNED
SEWAGE FROM BOATS AND SHIPS,
Congress, Washington, D.C.; and
Washington, D.C.
D.M. Fraser. GREAT LAKES AND UPPER MISSISSIPPI House.

Congressional Record, Vol 118, No 41, p E2703-2704 (daily ed.) March 17, 1972.

Descriptors: *Federal government, *State governments, *Governmental interrelations, *Ships, *Sewage disposal, Boating regulations, Legislation, Waste disposal, Political aspects, Legal aspects, Water pollution control, Water pollution sources, Regulation, Boats, Sewage effluents, Standards, Supervisory control (Power).

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Representative Fraser expressed his concern over a provision in House bill 11896 that would wipe out state regulations and laws prohibiting the dumping of raw or treated sewage from boats and ships into the Nation's lakes and rivers. The bill gives the Administrator of the Environmental Protection Administrator of the Environmental Protection Agency sole power to control treated or untreated sewage discharges from vessels. Twenty states presently have laws which prohibit dumping of raw or untreated sewage from vessels. To preserve the rights of states to prohibit such discharges, Representative Fraser introduced an amendment to House bill 11896. The amendment allows any state that desires greater environmental protection than is provided by the Environmental Protection Agency to completely prohibit vessel discharges of sewage. The Administrator would still be empowered to set standards, but these would become merely minimum standards. (Horwitz-Florida) W72-08031 W72-08031

U.S. MINING RIGHTS IN DEEP SEA BED.
Congress, Washington, D.C; and Senate,
Washington, D.C.

Congressional Record, Vol 118, No 39, p S3929 (daily ed.) March 14, 1972.

Descriptors: *Political aspects, *Oceans, *Beds, *International law, Legal aspects, Political constraints, Jurisdiction, Federal government, Governmental interrelations, United Nations, Regulation, Beds under water, Legislation.

Regulation, Beds under water, Legislation.

Senator Bellmon introduced the remarks of Senator Metcalf concerning the international ramifications of Senate bill 2801 as it pertains to deep ocean mining. The bill allows the United States to issue permits for mining rights to the deep seabed. The Chilean delegate to the United Nations Seabed Committee stated the bill would violate international law. Senator Metcalf disagreed with this position and informed the Senate of the following facts. First, the United Nations Moratorum Resolution, declaring that all nations must refrain from undersea exploitation beyond national jurisdiction, was not supported by the United States and is not international law. Second, the United Nations Legal Principles Resolution does not directly alter the right of seabed exploitation. The position of the United States is that there is a present right to exploit the deep seabed until a treaty is established. A practical, interim basis of deep ocean mining experience will be provided by Senate bill 2801, which will be of great value to the United Nations Seabed Committee concerning the preparation of a treaty. (Horwitz-Florida)

DRAWBRIDGE OPERATION REGULATIONS (OPPOSITION TO REGULATIONS ON BASIS OF RIVER POLLUTION), Washington, D.C. Office of Marine Environment

and Systems. W. M. Benkert.

Federal Register, Vol 37, No 66, p 6846-6847, April 5, 1972.

Descriptors: *Navigable rivers, *Bridges, *Coast Guard regulations, *Maryland, *Massachusetts, Boating regulations, Navigable waters, Environ-mental effects, Boating, Navigation, Recreation demand, Recreation, Social needs, Public rights, Water pollution sources, Wetlands. Identifiers: *Drawbridge operation, *North River (Mass), *Sinepuxent Bay (Md).

Drawbridge operation regulations on North River, Massachusetts and Sinepuxent Bay, Maryland are herein adopted. The regulations are intended to

protect the public right to free and unobstructed navigation on the navigable waters of the United States. Letters received in opposition to the North River regulation objected to the use of the River by large recreational craft and the ensuing pollution, river bank erosion, and marsh area damage. The Massachusetts Department of Natural Resources, however, reported the regulation would not have any deleterious long-range effects on the North River and its wetlands. No objections were registered to the Sinepuxent Bay regulation. (Ilkson-Florida)

NAVIGABLE WATERS SAFETY AND EN-VIRONMENTAL QUALITY ACT. Congress, Washington, D.C.; and Committee on Commerce (U.S. Senate). For primary bibliographic entry see Field 05G. W72-08034

FEDERAL WATER POLLUTION CONTROL ACT OF 1972.
Congress, Washington, D.C.; and House, Washington, D.C.

Congressional Record, Vol 118, No 40, p E2630-2632 (daily ed.) March 16, 1972.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Pollution, Abatement, *Water pollution control, *Political aspects, Environmental effects, Waste disposal, Economic feasibility, Economics, Water quality, Water quality control, Legislation, Water pollution, Legal aspects, Technology, Waste treatment, Planning, Water Quality Act, Permits, Law enforcement.

Identifiers: *National Environmental Protection

Congressman Dingell inserted a letter and comments from the League of Women Voters into the Record. The House version of the Water Pollution Control Act of 1972 is criticized by the League because it does not contain the zero discharge because it does not contain the zero discharge goals and effluent requirements which constitute the essence of the Senate bill. Also absent is protection for workers whose plants may be closed by strict environmental regulations. The House bill also: (1) limits citizen suits against polluters, (2) removes the federal permit program from Environmental Protection Agency review, and (3) weakens the Fish and Wildlife Coordination Act and the National Environmental Policy Act. A Business Week article which examined the change in philosophy in water pollution control, from in philosophy in water pollution control, from water quality standards to direct effluent limits, is also included. (Ilkson-Florida) W72-08035

HOTCHKISS GROVE ASS'N. V. WATER RESOURCES COMM. (JUDICIAL REVIEW OF PERMITS ALLOWING PIER CONSTRUCTION ON NAVIGABLE WATERS).

282 A.2d 890-894 (Conn. 1971).

Descriptors: *Connecticut, *Administrative decisions, *Navigable waters, *Riparian rights, *Piers, Littoral, Legal aspects, Judicial decisions, Administrative agencies, Permits, Flow, Recreation, Adjacent landowners, Common law, Beaches, Access routes, Beds, Public access, Relative rights, Supervisory control (Power), Legislation, Adjudication procedure.

Plaintiff littoral land owning corporation appealed defendant water resources commission's grant of permission to an adjoining landowner to construct a pier on Long Island Sound. Plaintiff contended that defendant's authority to regulate the erection of structures on tidal, coastal, or navigable waters with regard for erosion, improved navigation, recreation, adjoining land use, pollution control, state properties, and the right of parties, was unlawfully delegated. Plaintiff further contended that the reviewing court had excluded evidence showing the pier's adverse effects. Plaintiff also contended that defendant had previousity denied permission to construct the same pier. The Connecticut supreme court held that Connecticut's statutory standards for the regulation of structures on state waters were adequate and lawful. The court ruled that an upland owner's right to construct a pier is subject to the right of the public and adjacent landowners. The court further held that in reviewing an ex parte hearing, the court would hear evidence de novo as to facts on which the decision was based. The court ruled that the reviewing court should receive evidence concerning the prior application to construct a pier. A new trial was granted. (Grant-Florida)

CONTINUING RESOLUTION FOR WATER POLLUTION CONTROL,
Congress, Washington, D.C.,
J. F. Kemp.
Congressional Record, Vol 118, No 10, E640-641 (daily ed.) January 31, 1972.

Descriptors: *Federal Water Pollution Control Act, *Lake Erie, *Water pollution control, *Financing, *Government finance, Legislation, Great Lakes, Waste treatment, Sewage disposal, Federal government, State governments, Political aspects, Social aspects, Administrative agencies, Treatment facilities, Universities, Water pollution effects, Eutrophication, Federal budget.

The resolution is designed to continue programs under the Federal Water Pollution Control Act which have expired. Amendments to the Act are still in committee and the resolution will prevent water pollution control programs from terminating. The resolution can also be used for a major crash program to restore Lake Erie. The bill extends section 5 (n) of the Act and provides \$45 million for research, investigation, training, and information programs through June 1972. The bill authorizes \$7 million for research and development under section 6 (e). The bill provides \$6 million for state programs through June 1972; it provides added funds for waste treatment facilities under section 8 (d) of the Act. It also extends section 8 (c) of the Act under which states may be tion 8 (c) of the Act under which states may be reimbursed for the federal share of prefinanced projects. The reimbursement provision is needed projects. The reimbursement provision is needed to prevent loss of the momentum of the past two years. Another reason for passage of this resolution is that salaries are being paid without authorization. A lengthy letter from Dr. Robert A. Sweeney, Director of the Great Lakes Laboratory, is included. (Grant-Florida) W72-08037

STATE DEPARTMENT OF NATURAL RESOURCES V. CLINTONVILLE (MUNICIPAL LIABILITY FOR FISHKILLS RESULTING FROM UNAUTHORIZED LOWERING OF BOND). POND). 191 N.W.2d 866-872 (Wis. 1971).

Descriptors: *Wisconsin, *Damages, *Fishkill, *Administrative agencies, *Water levels, Water pollution, Water pollution effects, Mortality, Navigable waters, Impaired water quality, Turbidity, Water quality, Silting, Water pollution sources, Fish, Judicial decisions, State governments, Flow control, Aquatic habitats, Lake stages, Negligence, Administrative decisions.

Plaintiff State Department of Natural Resources (DNR) sought to recover \$34,528 in damages on grounds that defendant city lowered the water level in a city pond without DNR permission and thereby unlawfully caused the death of numerous fish. When water levels are rapidly lowered turbulence causes silt to fill fishes gills, killing them; therefore, in Wisconsin all lowerings are required by statute to be with the permission and under the

Field 06-WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

supervision of the DNR. Defendant twice rapidly lowered a city pond. Plaintiff argued that it was negligence per se not to obtain DNR permission and that a statute allowing civil actions for unlaw-fully killing fish imposed absolute liability. The Supreme Court of Wisconsin denied recovery and held that even though the lowering was without DNR permission and a violation of a DNR order which had the effect of law, the statute providing for civil actions did not create absolute liability. The court noted that the civil action statute only encompassed acts expressly prohibited by certain state laws, and that the act of lowering a pond without DNR permission was not therein prohibited. The lower court's decision finding de-fendant not liable was affirmed. (Blank-Florida)

ROMART PROPERTIES, INC. V. CITY OF NEW ROCHELLE (RELATIVE RIGHTS AS TO OWNERSHIP OF BED OF SALT WATER POND). 324 N.Y.S.2d 277-286 (Sup. Ct. 1971).

Descriptors: *New York, *Riparian land, *Riparian waters, "Ownership of beds, "Judicial deci-sions, Ponds, Navigable waters, Public rights, Land tenure, Adverse possession, Zoning, State governments, Sounds, Public lands, Adjacent lan-downers, Local governments, Beds under water.

Plaintiff title successors to a royal grant recipient sought to establish ownership of a pond bed. The pond was located at the end of a salt water creek and contained no fresh water. Defendant city as-serted title under riparian rights allegedly arising from the construction of a road over a portion of the pond. The state counterclaimed, asserting title to the bed as an arm of a state owned sound. The Westchester County New York Supreme Court held that unambiguous royal grants convey title to submerged lands within the grant. The court noted that plaintiffs' grant, including islands not otherwise disposed of and surrounding land, had been known as a separate body of water for 260 years and assessed and taxed by defendant city. Therefore, the court held that title was in plaintiffs as successors in title, rather than in the state as owner of the sound. The court rejected defendant city's claim of riparian rights, stating that sub-merged land is still treated as such even after it is filled. Although not ruling on the issue, the court noted that adverse possession does not ripen into title against the sovereign. (Blank-Florida) W72-08039

PROCEEDINGS--CANADA'S ANTI-PO-LLUTION LEGISLATION. For primary bibliographic entry see Field 05G. W72-08040

REGULATION OF HARD-MINERAL MINING ON THE CONTINENTAL SHELF, Oregon Univ., Eugene. School of Law. J. L. Jacobson, and T. A. Hanlon. Oregon Law Review, Vol 50, p 425-461, Spring 1971. 122 ref, 1 append.

Descriptors: *Continental shelf, *Mining, *Regulation, *Administrative agencies, Multiple-pur-pose projects, Social aspects, Monitoring, Mineral industry, Mining engineering, Excavation, Exploration, Exploitation, Submerged Lands Act, Marine geology, Oceans, Capital costs, Adminis-trative costs, Damages, Income, Environmental engineering, Environmental effects, Water pollution sources.

Identifiers: Absolute liability, Contiguous zone, Coastal waters.

Proposed environmental and multiple-use regulations for a continental shelf hard-mineral mining management scheme are discussed. The technical economic assumptions underlying the proposed regulations are listed. A preliminary step in a regulatory system is the creation of a govern-

mental agency to control the environmental aspect of all governmental activity. Two categories of regulations are considered: one concerns environmental protection and multiple use; the other con-cerns administration and revenue. General provisions of the multiple-use and environmental pro-tection category would include: (1) monitoring of operations, (2) absolute liability for damage, (3) aesthetic and ecological damage, and (4) criminal penalties. Exploration and extraction features of such provisions include: (1) application for permit, (2) consultation with other agencies, (3) public hearing, and (4) permit terms. These features are discussed in detail, including specific limitations on construction of artificial structures and restoration of the mined area. Administration and revenue features are also discussed. While most of the specialized ocean resource agencies should be combined for efficiency purposes, the environ-mental monitoring agency should be separate. The appendix includes a table of management patterns for each state. (Grant-Florida) W72-08041

ORGANIZING TO PROBE THE OCEANS: AN EXERCISE IN POLITICAL SCIENCE,

Miami Univ., Fla. Coll. of Law.

T. A. Clingan, Jr. Oregon Law Review, Vol 50, p 398-424, Spring 1971. 78 ref.

*Governmental interrelations, Descriptors: *Oceanography, *Administrative agencies, *Political aspects, Decision making, Legislation, Adoption of practices, Institutional constraints, Oceans, Marine fisheries, Federal government, Political constraints, Regulation, Legal aspects, Administrative decisions, Jurisdiction.

Technological developments have dictated that the United States unify all civil oceanographic efforts in one governmental organization. The historical development and creation of the National Oceanic and Atmospheric Administration (NOAA) is detailed. Congressional proposals and action relating to the reorganization are analyzed, and the 1969 report by the Commission on Marine Science, Engineering and Resources, recommend-ing creation of NOAA, is compared to the Nixon proposal. The primary differences involved are that: (1) the Coast Guard is excluded from the Agency by the Nixon proposal, (2) the Nixon proposal placed the Agency in the Department of Commerce instead of making it independent, and (3) the Nixon proposal merely relocated existing programs. Political developments which resulted in the Nixon proposal are analyzed. It is concluded that NOAA's lack of independence and exclusion of some of the proposed programs from its control present potential problems. However, the willingness of Congress to give the Agency powers it may need and the effectiveness of the Agency's administration will determine if NOAA can do its job. (Grant-Florida) W72-08042

ENVIRONMENTAL LAW-THE PUBLIC TRUST DOCTRINE: A USEFUL TOOL IN THE PRESERVATION OF SAND DUNES, F. B. Jackson.

North Carolina Law Review, Vol 49, p 973-978, August 1971, 26 ref.

Descriptors: *Beach erosion, *Shore protection, *Dunes, *North Carolina, Usufructuary right, Storms, Weathering, Riparian land, Riparian rights, Public rights, State governments, Administrative agencies, Judicial decisions, Constitutional law, State jurisdiction, Administrative decisions, Permits, Coasts, Beaches, Legislation. Identifiers: *Public trust doctrine, *Littoral rights, Coastal waters.

Sand dunes along the North Carolina coast serve to protect against storms and the action of the Atlantic Ocean. North Carolina statutes prohibit damage to or removal of sand dunes except where

authorized by administrative permit. There are, however, situations where the state attorney general should stop such removal even when it is general should study such removal even when it is authorized by permit. The special nature of sand dunes justifies state control. The public trust doc-trine can be used to protect these lands after ad-ministrative safeguards have failed. The rule that ministrative safeguards have failed. The rule that the riparian right is property and must be enjoyed in due subjection to public rights should apply to those who own littoral rights in coastal property. This property, in which the people are interested, should be protected by the state. To counteract pressure on administrative agencies by groups seeking to remove sand dunes, the North Carolina Attorney General's Department should use the public trust doctrine to protect coastline property. (Nielsen-Florida) W72-08044 Attorney General's Department should use the

QUESTIONS AND ANSWERS ON WATER QUALITY STANDARDS.
Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05G. W72-08099

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ANTIDEGRADATION. Environmental Protection Agency, Washington, D.C. Office of Water Programs.

For primary bibliographic entry see Field 05G. W72-08108

LIAISON - KEY TO HIGHWAY AND AGRICUL-TURAL DRAINAGE PROGRAMS, Illinois Univ., Urbana. Dept. of Agricultural En-

C. J. W. Drablos, and B. A. Jones, Jr. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 95, No. IRI, p 185-197, March, 1969. 1 fig, 3 ref.

Descriptors: *Agriculture, *Drainage, Legislation, *Highways, Water laws, *Inter-agency cooperation, Planning, Legal aspects. Identifiers: *Liaison programs.

The solution of highway and agricultural drainage problems reguires knowledge of engineering prac-tices and laws enacted by a particular jurisdiction. However, many of the problems that exist today have been the result of a lack of understanding or willingness of the various interests to accept their legal responsibilities rather than a lack of technical knowledge. Communication or the exchange of ideas and information is essential so that the highway authority can acquaint the landowners with proposed highway improvements at an early stage of planning and also learn their plans for con-servation and drainage improvements. The development of a memorandum of understanding between the various agencies, organizations, and landowners involved is the first step in solving mutual problems. Then the outlining of specific lines of communication is necessary if each agency is to fulfill its responsibilities. Some experiences are described and some procedures to follow to meet described and some procedures to rollow to line when the challenge for better solutions to highway and agricultural drainage problems are suggested. (Skogerboe-Colorado State)
W72-08115

REGIONAL MANAGEMENT OF WASTE SYSTEMS-ONE STATE'S APPROACH, Maryland Environmental Service, Annapolis. For primary bibliographic entry see Field 05G. W72-08149

WHOLESALING ENVIRONMENTAL VICES, Maryland Environmental Service, Annapolis.

T. D. McKewen.

Environmental Science and Technology, Vol. 6, No. 4, p 324-329, April 1972. 2 photo, 1 map.

WATER RESOURCES PLANNING—Field 06

Water Law and Institutions—Group 6E

Descriptors: *Environment, *State governments, *Maryland, *Waste disposal, *Institutions, Planning, Financing, Liquid wastes, Solid wastes. Identifiers: *Environmental services.

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Maryland Environmental Service (MES), which represents a new governmental approach to en-vironmental problems, is described. MES departs from the traditional state role of pollution regula-tor and provider of financial assistance. The state becomes a full partner with its subdivisions and industry by providing services ranging from planning, design, financing, construction, opera-tion, and maintenance of liquid and solid wastes treatment, reclamation, and disposal facilities. MES has historical roots in river basin planning in the US, and there are similar organizations in operation in New York, Ohio, and Ontario, Canada. MES is a statewide utility created to pro-Canada. MES is a statewine unity cleated to provide liquid and solid waste services to counties, municipalities, and industry. The Service develops liquid waste river basin plans and solid waste regional plans. MES has the power to finance, manage design and construction, and operate and maintain liquid and solid waste facilities. The advantages of the MES system include: (1) ability to act as an agent on behalf of a number of individual entities; (2) provision of opportunities for small communities to achieve economies of scale which are usually only available to larger cities, and (3) the ability to provide centralized and highly spethe ability to provide centralized and highly spe-cialized resources which individual jurisdictions cannot normally provide themselves. Funding is achieved through general appropriations, bond sales, revenues, and grants. All the Service's ac-tivities are self supporting, with the exception of planning costs. The prospects for success seem ex-cellent. (Strachan-Chicago) W72-08161

OCEAN AFFAIRS BIBLIOGRAPHY, A SELECTED LIST EMPHASIZING INTERNATIONAL LAW, POLITICS AND ECONOMICS OF OCEAN USES.

Woodrow Wilson International Center for Scholars, Washington, D.C. Ocean Series No 302, September 1971. 201 p, Price: \$1.25.

Descriptors: *Bibliographies, *Oceans, *Interna-tional law, Control, Coordination, Fisheries, Fish management, Water pollution, Water pollution control, Nuclear wastes, Path of pollutants, Ships, Water pollution sources, Foreign research, Oceanography, Documentation, International waters, Military aspects, Continental shelf, Estuarine environment.

An author index is provided for the 1685 entries which deal principally with international law, ocean uses, and major proposals to extend the coverage of law and cooperative practices. The en-tries are listed under the subjects: reference works, boundaries, territorial waters, seabed, conworks, boundaries, termoral waters, seabed, continental shelf, resources, living resources, pollution, shipping, military, research. About 30 of 204 entries in the pollution section concern nuclear wastes or nuclear ships. Many of the 254 entries in the living resources section involve pollution of fish tries to the section of the content of the con radioactivity. (Bopp-ORNL)
W72-08238

WASTE MANAGEMENT FOR FEEDLOTS, Nebraska Univ., Lincoln. Coll. of Agriculture. For primary bibliographic entry see Field 05G. W72-08305

SENATE, 86-0, BACKS MAJOR WATER POL-LUTION CONTROL BILL.

Congressional Quarterly Weekly Report, Vol 29, p 2313-2317, November 13, 1971.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Water pollution con-

trol, *Political aspects, Water quality control, Permits, Legislation, Water pollution treatment, Water pollution sources, Treatment facilities, Waste treatment, Sewage effluents, Sewage treatment, Navigable waters, Regulation, Penalties (Legal), Governmental interrelations, Federal jurisdiction, Local governments, Grants, Administrative agencies, Industrial wastes, Municipal wastes, Water quality standards, Pollution taxes (Charges).

The unanimously passed Senate Bill S2770 would amend the Federal Water Pollution Control Act by increasing the federal investment in sewer construction and waste treatment facilities, requiring local governments to charge user fees for industrial waste treatment, requiring federal permits for discharging wastes into navigable waters, and requiring industrial polluters to install the latest abatement equipment. Radioactive dumping would be prohibited and ocean dumping would require a federal license. Background information concern ing congressional hearings and expired or lapsed programs replaced by the Bill is included. Committee action is discussed. A major change is proposed from water quality standards to effluent limits as an enforcement mechanism. Contrasting views are presented, and floor action is discussed. The only major amendment to the Bill was an \$800 million program for loans to small businesses. A conflict over Corps of Engineer approval for dredged material dumping was resolved by permitting Corps approval, subject to a finding by the Environmental Protection Agency that the dumping would harm water supplies. Two amendments relating to funding were defeated. Provisions of the Bill are briefly summarized. (Grant-Florida) W72-08308

REPRESENTATIVES ABZUG AND RANGEL CRITIQUE OF WATER POLLUTION BILL IDENTIFIES ITS WEAKNESSES. Congressional Record, Vol. 118, No. 40, p. E2652-2660 (daily ed.) March 16, 1972.

Descriptors: *Environmental effects, *Federal Water Pollution Control Act, *Water quality standards, *Legislation, *Waste disposal, Water quality, Water quality standards, *Legislation, *Waste disposal, Water quality, Water quality control, Water pollution, Legal aspects, Law enforcement, Technology, Waste treatment, Economics, Permits, Planning, Water Quality Act, Jurisdiction, Federal jurisdiction, State jurisdiction, Rivers and Harbors Act.

Identifiers: Standing (Legal), National Environmental Policy Act.

The House version of the Federal Water Pollution Control Act of 1972 is criticized as a step backward. Representatives Abzug and Rangel feel that the House bill has no effective water quality goals or effluent limitations. The bill would repeal federal control over waste discharge permits. It would also allow states to set low pollution standards and thereby attract industry from states with high standards. The bill also seeks to weaken the National Environmental Policy Act and the Fish and Wildlife Coordination Act, as well as effectively repealing the 1899 Refuse Act. Water quality decisions would be taken away from the Environmental Protection Agency and given to agencies with narrower environmental concern. Citizen suits would be limited. In certain instances the bill gives polluters immunity from enforcement actions by the Environmental Protection Agency. The oil industry would be exempted from certain controls, and the bill would discourage development of new technology. A letter signed by eleven other Congressmen listed the same basic objections. A summary of positive aspects of the Refuse Act Permit Program is included. (Ilkson-Florida) W72-08309

RESOLUTION OF MINNESOTA POLLUTION CONTROL AGENCY.

Congressional Record, Vol. 118, No. 42, p. E2767 (daily ed.) March 20, 1972.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Water pollution control, *Pollution abatement, Legislation, Politicontrol, Foliution adatement, Legislation, Foliu-cal aspects, Regulation, Legal aspects, Law en-forcement, Federal government, State govern-ments, Governmental interrelations, Project planning, Effluents, Environmental effects, Ad-ministrative agencies, *Minnesota.

Representative Dingell inserted into the Record a resolution of the Minnesota Pollution Control Agency concerning the clean water package under consideration by Congress. Any major legislation to amend the Federal Water Quality Act should contain the following five provisions: (1) the federal government must have the right to veto state permits issued to individuals who discharge effluent in intrastate waters: (2) individual states. effluent in intrastate waters; (2) individual states must be allowed to set pollution control standards stronger than minimum federal standards; (3) 1985 stronger than minimum federal standards; (3) 1985 must be designated as the deadline for achieving zero discharge of pollutants into the nation's waters, and this should be a national policy; (4) and citizen or group should be given standing to sue to abate pollution or to challenge any arbitrary and unfounded administrative action; and (5) the spirit and letter of the National Environmental Policy Act must be followed, and all of the information required in anyticon restal in mack tate. mation required in environmental impact statements must be obtained before granting effluent discharge permits. (Horwitz-Florida) W72-08310

INTERSTATE WATERS OF STATE OF ALABAMA; PROPOSED WATER QUALITY STANDARDS, Environmental Protection Agency, Washington,

W. D. Ruckelshaus. Federal Resigster, Vol. 37, No. 49, p. 5260-5262, March 11, 1972. 1 tab.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Alabama, *Water quality control, Interstate rivers, Environmental effects, Governmental interrelations, Wastes, Waste disposal, Waste treatment, Radioactivity, Temperature control, Bacteria, Toxicity, Dissolved oxygen, Turbidity, Regulation, Legislation, Water quality, Water pollution control.

Notice is herein provided of proposed regulations setting forth water quality standards for the interstate waters of Alabama. Interstate waters to which the regulations would apply are listed. It is intended that the quality of the interstate waters of Alabama not be lower than the quality existing at Aladama not be lower than the quanty existing at the date of implementation. Requirements for tem-perature change, dissolved oxygen, bacteria, radioactivity, turbidity, toxicity, and waste treat-ment are included. Implementation plans and procedures for revision of the standards are set freth (Histor Florida). forth. (Ilkson-Florida) W72-08311

FEDERAL CONTROL OF WATER POLLU-TION: THE REFUSE ACT PERMIT PROGRAM, For primary bibliographic entry see Field 05G. W72-08314

Committee on Public Works (U. S. Senate). Sub-committee on Air and Water Pollution. For primary bibliographic entry see Field 05G. W72-08315 INTERSTATE ENVIRONMENT COMPACT.

WATER RESOURCES DEVELOPMENT IN WISCONSIN. Corps of Engineers, Chicago, Ill. North Central

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

For primary bibliographic entry see Field 08A. W72-08316

WATER RESOURCES DEVELOPMENT IN

Corps of Engineers, Chicago, Ill. North Central For primary bibliographic entry see Field 08A. W72-08317

WATER RESOURCES DEVELOPMENT IN

MICHIGAN Corps of Engineers, Chicago, Ill. North Central

For primary bibliographic entry see Field 08A. W72-08318

ZERO DISCHARGE: NATIONAL GOAL OR NATIONAL CALAMITY,
Department of Commerce, Washington, D.C.

For primary bibliographic entry see Field 05G.

WATERSHED FIELD INSPECTIONS-1971. Committee on Public Works (U. S. House). Sub-committee on Conservation and Watershed. For primary bibliographic entry see Field 04A. W72-08320

ENVIRONMENTAL AWAKENING--MESSAGE FROM THE PRESIDENT OF THE UNITED STATES,

Congressional Record, Vol. 118, No. 16, H840-845 (daily ed.) February 8, 1972.

Descriptors: *Water pollution control, *Waste disposal, *Wetlands, *Oil pollution, *Legislation, Sediment control, Soil contamination, Pesticide toxicity, Toxins, Lead, Wildlife, Land use, Parks, Sulfur compounds, Recycling, Water pollution, Groundwater pollution, Sulfur, Sediments, Toxicity, Eigh

The President reviewed programs sent to Congress The President reviewed programs sent to Congress in his 1971 environmental message. He indicated that while most of the suggested legislation had been the subject of Congressional hearings, none of it had received final congressional action; he urged such action in 1972. The remainder of the speech presented proposals which should be considered by Congress. The President proposed that multiplies and requirements he established to guidelines and requirements be established to regulate disposal of toxic wastes. The increasing disposal of such wastes on land imposes a constant danger to underground and surface waters. He also called for regulatory programs to control sedi-ment from earth-moving activities such as building and road construction which affects water quality. Other water resources related proposals included a plan to protect wetlands through a limitation on tax benefits from coastal wetland development. Lastly, he called for continued cooperation in the international movement to control marine pollution. In addition to these water resource proposals the President listed numerous other environmental areas where legislation is needed. These areas included air, land use, energy, endangered species, recycling and lead base paint poisoning. (Nielsen-W72-08321

THE WATERSHED PROTECTION AND FLOOD PREVENTION PROGRAM,

U.S. Congress, Washington, D.C.; and Senate, Washington, D.C.

H. E. Talmadge. Congressional Record, Vol. 118, No. 12, S978-980 (daily ed.) February 2, 1972.

Descriptors: *Watershed management, *Project benefits, *Environmental effects, *Channel im-provement, *Watershed Protect. and Flood Prev. Act, Water supply, Watersheds (Basins), Siltation,

Economics, Recreation, Land use, Land management, Floods, Flood control, Legislation, Cost analysis, Fish and wildlife, Channeling, Federal government, Agricultural runoff. Identifiers: National Environmental Policy Act.

The Watershed Protection and Flood Prevention Program has improved the economy of project areas, increased recreational opportunities, and enhanced fish and wildlife growth. Senate bill 2981 would make needed changes in the Program by providing federal funds for municipal water projects, fostering better land use, and funding programs to control agricultural pollution. A speech delivered by Undersecretary of Agriculture J. Phil Campbell was inserted into the Record. He feels the Program's critics see only the negative aspects. The Program has positive economic and environmental effects. It also retards siltation, provides municipalities with a dependable water supply, and creates recreational opportunities. Through integrated approach losses in any area are offset by gain in others, yielding a net gain. Environmental impact statements are being prepared for both existing and planned projects. Only projects planned over a decade ago pose any serious adverse environmental effects. These constitute a small percentage of projects. Guidelines for review and development of watersheds are listed. New projects include all environmental considera-tions and comply fully with the National Environmental Policy Act. Project planning takes into account both environmental and economic factors. (Ilkson-Florida) W72-08322

NATIONAL ENVIRONMENTAL CENTER ACT OF 1972,

Washington, D.C.; and House, Congress, Washington, D.C.

Frey, Jr. Congressional Record, Vol. 118, No. 11, E661-662 (daily ed.) February 1, 1972.

Descriptors: *Administrative agencies, *Research facilities, *Water pollution control, *Pollution abatement, Water pollution, Air pollution, Federal government, Legal aspects, Facilities, Laboratories, Research and development, Research testing, Legislation, Political aspects, Non-structural alter-

Virtually all current efforts of federal administrative agencies dealing with environmental problems are limited to a part of the problem. There is no single public or private entity with the mandate and resources to conduct systematic research on matters relating to the entire global environment. The bill to establish the National Environmental Center (NEC) would fill this role and complement, not supplant, existing agencies. NEC policy would be established by a seven-man board of trustees. The Board would be authorized to establish up to six independent National Environmental Laborastablished at the side of an existing facility. Such a facility is located at Cape Kennedy. An environmental facility here would also aid in finding employment for displaced missile workers. The working relationship between the independent NEC and other agencies should be cooperative. NEC's independence is necessary so that long term needs are not compromised for the benefit of short term exigencies. This distinguishes NEC from other mission-oriented agencies. The Senate has already passed this measure. (Grant-Florida) W72-08323

PACEM IN MARIBUS, (PEACE IN THE OCEANS), Center for the Study of Democratic Institutions,

Santa Barbara, Calif. E. M. Borgese.

Oregon Law Review, Vol. 50, No 3, p. 373-377, Spring 1971.

*International law, *Oceans, Descriptors: Descriptors: "International law, "Oceans, Aquatic environment, "Exploitation," International waters, Exploration, Technology, Law of the sea, Legal aspects, Marine geology, Oceanography, Water pollution, Beds, United Nations, Treaties, Foreign countries, Beds under water, Relative rights, Regime.

Relative rights, Regime.

Gentifiers: "Coastal waters, Territorial waters, Seabed, "Pacem in Maribus project.

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The Center for the Study of Democratic Institutions recently convened an international convocation to clarify issues raised by impending ocean exploration. Two main considerations were the separation of the ocean from the problem of environmental deterioration and the expansion of ocean exploitation technology. The operating prinles of the conference are discussed, inclu (1) indivisibility of the ocean environment, (2) limiting national control of vast areas of the ocean floor, (3) coastal pollution threats which have rendered traditional sovereignty concepts ob-solete, (4) common heritage of the oceans, (5) planning ecological units without regard to political divisions, and (6) the need for free flow of information between governments. Related actions of the United Nations are discussed. Five study projects were carried out for the conference: (1) existing models to cope with the marine revolu-tion, (2) economic potential of the oceans, (3) pol-lution in the Mediterranean, (4) a proposed ocean development tax, and (5) science policy. The new model for ocean control must be considered in the context of international relations generally. Problems must be resolved by international cooperation, due to the environmental threat. (Grant-Florida)

PLANNING AND ZONING-LAND SUBDIVI-

Maine Rev. Stat. Ann. tit. 30, Section 4956 (Supp.

Descriptors: *Maine, *Zoning, *Land use, *Water pollution control, *Water quality control, City planning, Planning, Local governments, Future planning (Projected), Community development, Urbanization, Suburban areas, Non-structural alternatives, Legislation, Legal aspects, Administra-tion, Regulation, Water pollution, Water supply, Water quality, Penalties (Legal), Municipal wastes, Wastes disposal, Local governments.

No conveyance of any land in a subdivision may be made unless the subdivision has been approved by the appropriate local authorities. When reviewing any subdivision for approval, the authorities shall consider, among other criteria, whether the subdivision will result in undue air or water pollution, considering: the elevation and slope of the land and its effect on effluents, the availability of streams for effluent disposal, the nature of the soils and their ability to support waste disposal, and applicable health and water resources regulations. Additional considerations include whether the subdivision: will impose an unreasonable burden on the water supply, will provide for adequate waste disposal, will have an undue adverse effect on the scenic or natural beauty of the area, will adversely affect the quality of any nearby body of water or adversely affect the shoreline of such body, or will cause unreasonable soil erosion or reduction of the capacity of the land to hold water. Violations may be punished by fines of not more than \$1,000. Furthermore, provisions are included for injunctions against violations. (Brackins-Florida) W72-08325

WATER IMPROVEMENT COMMISSION--DEFINITIONS, WASTE DISCHARGE LICEN-SES, APPLICATIONS FOR LICENSES, AP-PEALS, DISCHARGE OF OIL PROHIBITED,

CERTAIN DEPOSITS AND DISCHARGES PROHIBITED.

Maine Rev. Stat. Ann. tit. 38, Subsections 361-A, 413 thru 417 (Supp. 1972).

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Descriptors: "Maine, "Waste disposal, "Permits, "Water quality control, "Water pollution control, Water Quality Act, Water pollution, Legislation, Legal aspects, Remedies, Oil pollution, Law enforcement, Water law, Municipal wastes, Industrial wastes, Riparian rights, Water quality standards, Regulation, Administrative agencies. Identifiers: "Maine Waste Discharge Act.

The Water Improvement Commission is designated as the state agency for purposes of accepting federal funds for water pollution control. cepting federal funds for water pollution control.

No discharge may be made into waters without obtaining a license. Exemptions to licensing exist as to discharges by a municipality existing before 1959 or discharges by others existing before 1953. However, any significant increases beyond that existing at those dates must be licensed. In the event of a transfer of ownership the license granted shall be void and the new owner shall seek a license. The applicant for a license shall show. granted shall be void and the new owner shall seek a license. The applicant for a license shall show that the discharge into classified waters is receiving the best practicable treatment and that it will not lower the quality of receiving waters. Regulations are also set forth for unclassified waters and waters of higher quality. Those exempted from licensing shall register the quality and quantity of discharges. Procedures regulating licensing and appeals are set forth. A riparian owner may not sue one licensed to discharge for nuisance, but he may sue if a discharge will lower the statutory classification of a body of water or if he suffers actual damage. Discharge of oil and other enumerated materials are prohibited. (Ilkson-Florida) W72-08326

THE NIXON PROPOSAL FOR AN INTERNA-TIONAL SEABED AUTHORITY, Oregon Univ., Eugene. School of Law.

J. E. Frohnmayer.
Oregon Law Review, Vol 50, p 599-618, Spring 1971. 96 ref.

Descriptors: *Ownership of beds, *Boundary disputes, *Treaties, *Law of the sea, *International law, *Continental shelf, International waters, Oceans, Boundaries (Property), Governmental interrelations, Legal aspects, Beds, Beds under water, Economics, Jurisdiction, Exploration, Exploitation, Oil industry, Leases, Mining, Foreign countries, United States, United Nations. Identifiers: Coastal waters.

The Nixon Proposal is a compromise on setting internationally accepted limits for jurisdiction of the sea and exclusive exploration and exploitation rights for the continental shelf. Present lack of agreement stems from the underdeveloped nations' attempted exercise of jurisdiction of the sea, ranging up to 200 miles, and the desire of technological nations to have freedom of exploration of coastal regions. The Nixon Proposal limits exclusive jurisdiction of coastal states to the 1958 exclusive jurisdiction of coastal states to the 1958 Convention of the Continental Shelf's 200 meter isobath limit. The remainder of the shelf would be under the trusteeship of coastal states to license franchises. Part of the income from such licensing would go to an international fund for underdeveloped nations. The treaty would be adderdeveloped nations. The treaty would be administered by an international agency composed of subscribing nations. Domestic and international criticism has pointed to the treaty's infringement of freedom of the seas. The significance of the Nixon Proposal is that it has been formulated by the President. It also provides a basis for discussion. (Ilkson-Florida)

SALINE WATER CONVERSION PROGRAM, Congress, Washington, D.C.; and House, Washington, D.C. H. T. Johnson.

Congressional Record, Vol 118, No 33, p H1783-1786 (daily ed), March 6, 1972.

Descriptors: *Desalination processes, *Desalination, *Research and development, *Financing, *Federal government, Political aspects, Project planning, Legislation, Budgeting, Economics, Administration, Saline water, Brackish water, Brines, Water pollution sources, Saline waterfresh water interfaces, Saline water interfaces, Saline water interfaces, Desalination apparatus.

Representative Johnson introduced a bill to Representative Johnson introduced a bill to authorize appropriations for the saline water conversion program for fiscal year 1973. The bill authorizes a total of \$26,871,000 which is to be expended as follows: (1) research expenses, not more than \$5,850,000; (2) development expenses, not more than \$12,131,000; (3) design, construction, acquisition, modification, operation, and maintenance of saline water conversion test beds and test feeliblies, not more than \$5,085,000; (4) and test facilities, not more than \$5,085,000; (4) design, construction, acquisition, modification, operation, and maintenance of saline water conoperation, and maintenance of saline water conversion modules, not more than \$1,075,000; and (5) administration and coordination, not more than \$2,730,000. Representative Aspinall supported the bill and pointed out that the project will not result in a dramatic research breakthrough but rather a gradual workthrough. The program will provide continuing research into production of water in a setting of constantly changing economic factors. Representative Hosmer discussed the various research and development programs, including: (1) research and development programs, including: (1) desalting procedures; (2) sea water and brackish uesating procedures; (2) sea water and brackish water reverse osmosis systems; and (3) desalting geothermal brines. The increasing need for fresh water is recognized, along with the role that this research program will play in meeting the need. (Horwitz-Florida)

A BILL TO PROVIDE FOR THE REGULATION OF GROUND WATERS WITHIN THE UNITED STATES AND THE SUBSURFACE DISPOSAL OF WASTES.

House Bill 12885, 92d Cong, 2d Sess. (1972). 7 p.

Descriptors: *Ground water resources, *Water management (Applied), *Legislation, *Underground waste disposal, Waste disposal, Drainage wells, Injection wells, Waste disposal wells, Waste water treatment, Federal jurisdiction, Environmental control, Surface-groundwater relationships, Penalties (Legal) Assessment Law enforcement Results. (Legal), Assessments, Law enforcement, Regula-tion, Legal aspects, Well permits, Well regula-tions, Administrative agencies, Water quality stan-

Identifiers: National Environmental Policy Act, Injunctions (Prohibitory).

Regulation of groundwater use and subsurface disposal is proposed. The administrator of the En-vironmental Protection Agency would be vested with the exclusive authority to determine ground-waters within the United States, designate proper withdrawals and uses of these waters, designate suitable wastes and areas for subsurface disposal, and provide criteria for construction and operation of waste disposal wells. The administrator also is of waste disposal wells. The administrator also is given authority to promulgate injection pressures and rates, require treatment of wastes, define zones for waste injection, search for alternative methods of waste handling, and permit exceptions to the regulations. The administrator shall revise and develop standards as appropriate and necessary to implement the act. United States district courts may enforce the standards under the act by ry to implement the act. United States district courts may enforce the standards under the act by injunction. Furthermore, a \$10,000 civil penalty may be assessed by the administrator for violation of the standards. All state laws relating to use or withdrawal of groundwaters are suspended unless the administrator finds the law conforms to the act's standards. All permits previously issued which relate to activities regulated by the act are terminated. The administrator shall survey all wells using or withdrawing groundwater and terminate operation of those found violating the act. (Grant-Florida) W72-08347

A BILL TO AMEND THE OUTER CONTINENTAL SHELF LANDS ACT, AS AMENDED, TO REQUIRE A STUDY OF THE ENVIRONMENTAL IMPACT OF MINERAL EXPLORATION IN THE ATLANTIC OCEAN.

House Bill 13896, 92d Cong, 2d Sess. (1972). 2 p.

Descriptors: *Continental shelf, *Environmental effects, *Mining, *Submerged Lands Act, Atlantic Ocean, Oceans, Exploitation, Exploration, Administrative agencies, Legal aspects, Legislation, Mineralogy, Oil, Aquatic life, Marine animals, Fish, Shelfish, Economic impact, Beds. Identifiers: *Coastal waters.

The Secretary of the Interior, in conjunction with the administrators of the Environmental Protec-tion Agency and the National Oceanic and At-mospheric Administration, shall conduct an ac-celerated study on environmental and other faccelerated study on environmental and other fac-tors related to mineral exploitation on the outer Atlantic continental shelf from the Canadian border to the Georgia-Florida border. Special emphasis is to be placed on the effects of petrole-um exploitation. The study shall include evalua-tion of the effect of exploitation on fish, shellfish, and other forms of marine life; the probability of an accident which would cause an adverse effect an accident which would cause an adverse effect on marine ecosystems; assessment of the public interest in such exploitation; and the economic and environmental effect of prohibiting any such exploitation within one hundred miles of the United States. The Secretary shall consult with interested industrial, environmental, and educational groups in making the study and shall report to Congress in two years. Notwithstanding other provisions of the bill, the Secretary shall not award mineral leases covering such lands until one year after submission of the report to Congress. (Grant-Florida) W72-08348

WATER QUALITY PROTECTION FOR IN-LAND LAKES IN WISCONSIN: A COM-PREHENSIVE APPROACH TO WATER POLLU-

TION, Wisconsin Univ., Madison. School of Natural Resources. For primary bibliographic entry see Field 05G. W72-08349

THE INTERNATIONAL SEABED AREA Auckland Univ. (New Zealand). School of Law. F. M. Auburn. International and Comparative Law Quarterly, Vol. 20, p. 173-194, April, 1971. 157 ref.

Descriptors: *Continental shelf, *Continental slope, *International law, *Exploitation, Exploration, Legal aspects, International waters, Treaties, Oceans, Ownership of beds, Boundary disputes, Islands, Mining, Mineralogy, Research and development, Marine biology, Jurisdiction, Relative rights, United Nations, United States, Foreign countries. countries.

Identifiers: *Seabeds, *Coastal waters.

The draft convention on the International Seabed Area (ISA) which the United States submitted to the United Nations is discussed. The seabed boundary question is largely shifted to the continental slope and rise, since the draft defines the continental shelf at 200-meter depth. Technological breakthroughs which have made deep-sea exploitation possible are examined. The legal context of the problem is discussed in terms of why a new convention is necessary. Generally, under the treaty the ISA is bounded on the landward side by the 200-meter mark. The ISA, covering the entire seabed and its subsoil, will be reserved for peace-ful international purposes. Between the 200-meter mark and an undetermined line, the coastal state

Field 06—WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

will license exploration and exploitation. Part of this revenue will go to the International Seabed Resource Authority (ISRA). Specific problems are discussed concerning: (1) seabed definition, (2) boundaries, (3) islands, (4) high seas, (5) minerals, (6) non-mineral resources, (7) exploration and exploitation, (8) scientific research, (9) marine environment, (10) peaceful purposes, (11) sovereignty and jurisdiction, (12) revenue, and (13) reserva-tions. The convention is loosely drafted, but it contains significant concessions by the United States. (Grant-Florida) W72-08350

REFLECTIONS ON BRUSSELS: IMCO AND THE 1969 POLLUTION CONVENTIONS, For primary bibliographic entry see Field 05G.

THE PRESIDENT'S 1971 ENVIRONMENTAL

Council on Environmental Quality, Washington,

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$2.25. March 1971. 306 p.

Descriptors: *Federal government, *Regulation, *Water pollution control, *Legislation, *Water quality control, Government finance, Government supports, Financing, Water resources developnt, Administration, Planning, Municipal stes, Water quality standards, Navigable ters, Permits, Comprehensive planning, wastes, Economics, Projects, Project planning, Water management (Applied), Water policy, Coordina-

Identifiers: *Ocean dumping, *Environmental Institute, National Environmental Policy Act.

The President's message proposes measures to strengthen pollution control problems, control emerging problems, promote environmental quali-ty in land use decisions, and establish an Environmental Institute to conduct studies and recom-mend policy alternatives. A 12 billion dollar na-tional program is to be instituted to ensure adequate funds for construction of effective mu nicipal waste treatment facilities. The President also recommends a national policy banning unregulated ocean dumping and placing strict limits on ocean disposal of any harmful environmental materials; included in this recommendation is legislation requiring a permit to dump any material into the oceans, estuaries, or Great Lakes and authorizing the Environmental Protection Agency to ban dumping of wastes dangerous to the marine ecosystem. Also included are legislative bills, letters of transmittal to Congress, and analyses of the proposed legislation. (Blank-Florida) W72-08352

REGULATORY APPROACH TO CONTROL OF HEAVY METAL DISCHARGES, Tennessee Water Quality Control Board, Nash-

ville. For primary bibliographic entry see Field 05G. W72-08377

PROJECT TO PLAN FOR ORDERLY DEVELOPMENT OF ARKANSAS-VERDIGRIS WATERWAY AREA: VOLUME 1: SUMMARY

Frontiers of Science Foundation of Oklahoma, Inc., Oklahoma City.

For primary bibliographic entry see Field 04A. W72-08422

I

INSTITUTIONAL INFLUENCES IN IRRIGA-TION WATER MANAGEMENT,
Texas A and M Univ., College Station. Dept. of
Agricultural Economics and Rural Sociology. For primary bibliographic entry see Field 03F. W72-08458

6F. Nonstructural Alternatives

WETLANDS-ZONING. For primary bibliographic entry see Field 06E. W72-08030

PROJECT TO PLAN FOR ORDERLY DEVELOPMENT OF ARKANSAS-VERDIGRIS WATERWAY AREA: VOLUME 1: SUMMARY Frontiers of Science Foundation of Oklahoma,

For primary bibliographic entry see Field 04A.
W72-08422

6G. Ecologic Impact of Water Development

ATLANTIC COAST OF LONG ISLAND, FIRE ISLAND INLET AND SHORE WESTERLY TO JONES INLET, NEW YORK, BEACH EROSION JONES INLET, NEW YORK, BEACH EROSION CONTROL AND NAVIGATION PROJECT, AT-LANTIC OCEAN AND GREAT SOUTH BAY, NEW YORK (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, New York.

For primary bibliographic entry see Field 08A. W72-08001

COUNCIL BLUFF RESERVOIR, POTOSI RANGER DISTRICT, CLARK NATIONAL FOREST, IRON COUNTY, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT). FOREST SERVICE (USDA), Milwaukee, Wis. Eastern Patrics. Region. For primary bibliographic entry see Field 04A. W72-08002

VALCOUR HARBOR, LAKE CHAMPLAIN, NEW YORK (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, New York. For primary bibliographic entry see Field 08A.

W72-08003

LOWER GRANITE LOCK AND DAM, SNAKE RIVER, WASHINGTON AND IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 08A.

CLIFTY CREEK LAKE, CLIFTY CREEK, WABASH RIVER BASIN, INDIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-08005

SALT CREEK LAKE, SALT CREEK, SCIOTO RIVER BASIN, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va. For primary bibliographic entry see Field 08A. W72-08006

LAPWAI CREEK, CULDESAC, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 08D. W72-08007

FINAL ENVIRONMENTAL STATEMENT, SHOBE CANYON CHANNEL CLEARING (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Walla Walla, Wash For primary bibliographic entry see Field 04A. W72-08008

YEAGER DITCH PROJECT SOUTHEAST TEXAS RESOURCE CONSERVA-TION AND DEVELOPMENT PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

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Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04D. W72-08009

COSUMNES RIVER DIVISION, INITIAL PHASE, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A.

PORT JEFFERSON HARBOR, NEW YORK NAVIGATION PROJECT (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, New York. For primary bibliographic entry see Field 04A. W72-08011

OPEN CHANNEL WORK, OHIO RIVER, PENNSYLVANIA, WEST VIRGINIA, OHIO, KENTUCKY, INDIANA, AND ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATEMENT). Ohio River Div. Labs., Cincinnati. For primary bibliographic entry see Field 04A. W72-08012

GREAT FALLS FLOOD CONTROL PROJECT, SUN RIVER, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). For primary bibliographic entry see Field 08A. W72-08013 Army Engineer District, Omaha, Neb.

DUBOIS, PENNSYLVANIA LOCAL FLOOD PROTECTION PROJECT, SANDY LICK CREEK (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Pittsburgh, Pa. For primary bibliographic entry see Field 04A. W72-08014

ATLANTIC HARBOR OF REFUGE, CARTERET COUNTY, NORTH CAROLINA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Army Engineer District, Wilmington, N. C. For primary bibliographic entry see Field 08D. W72-08015

LAS CRUCES LOCAL PROTECTION, LAS CRUCES, NEW MEXICO (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Albuquerque, N. Mex. For primary bibliographic entry see Field 08A. W72-08016

PROPOSED SEWAGE TREATMENT FACILI-TIES, SOLDOTNA, ALASKA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 05D. W72-08017

SHORT BAYOU DRAINAGE DISTRICT PRO-JECT MEASURE, SOUTHEAST DELTA RC AND D PROJECT, MISSISSIPPI (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04A. W72-08018

Ecologic Impact of Water Development—Group 6G

OKEECHOBEE WATERWAY (VICINITY OF FT. MYERS, FLORIDA) (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Jacksonville, Fla. For primary bibliographic entry see Field 04A. W72-08019

VA-

STOCKTON SHIP CHANNEL BANK PROTEC-TION. SAN FRANCISCO BAY TO STOCKTON, CALIFORNIA (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 04D. W72-08020

PARK RIVER CONDUIT, HARTFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New Endand Div. For primary bibliographic entry see Field 08A. W72-08021

REMARKS OF HON. JOHN DINGELL TO CONFERENCE ON ENVIRONMENTAL LAW.
Congress, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E. W72-08028

OIL POLLUTION: NEGOTIATION--AN ALTER-NATIVE TO INTERVENTION,
Office of the Judge Advocate General (Army), Washington, D.C. R. P. Cundick.

International Lawyer, Vol 6, p 34-41, January 1972. 19 ref.

Descriptors: *International law, *Oil spills, *Ships, *Treaties, *Negotiations, Remedies, Oil industry, International waters, Coasts, Law of the sea, Legal aspects, Oil pollution, Oceans, Disasters, Foreign waters, Damages, Foreign counsters, Identifiers: *Coastal waters, *Intervention.

The need for a consensual approach to resolve the consequences of maritime oil spill disasters is examined. South Africa's recent use of negotiation instead of intervention is considered. More than half of recent oil tanker disasters have occurred on the high seas. The 1969 Convention relating to oil spills permits a coastal state to intervene against foreign vessels on the high seas to prevent, mitigate, or eliminate imminent danger of coastal oil pollution damage. Duties imposed by the Convention require considerable restraint by the intervening state, and the possibility of breach of these duties is not remote. Therefore, an attempt at negotiation provides a particularly pragmatic solution in view of some potential questions which would be mooted: (1) whether the vessel is on the high seas, (2) whether the facts warranted intervention, and (3) whether intervention is reasona-ble. Because intervention is an extreme measure, the negotiation alternative makes any final decision acceptable to all parties involved. If a reasonable compromise is not reached, by having exhausted this alternative, a state's claim to intervene is considerably enhanced. (Ilkson-Florida) W72-08043

ECOLOGICAL IMPACTS OF WATER PRO-JECTS IN CALIFORNIA, California Univ., Davis. Dept. of Water Science

and Engineering. R. M. Hagan, and E. B. Roberts.

Journal of Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR 1, Paper 8780, p 25-48, March 1972. 40 ref.

Descriptors: *Water resources development, *Environmental effects, *Reservoirs, *California, Environmental engineering, Ecology, Social aspects, Water management (Applied), Water distribution

Water projects may have ecological impacts in great diversity--in the area of impou downstream from impoundments; in delta, bay, or ocean areas; and in distant areas of water use. either agricultural or urban. Examples of several kinds of impacts are presented, emphasizing those occurring in California. Recognition of the ecological impacts of water projects by individuals depends on where they live and how they are af-fected by the proposed project. Concerns with environmental impacts presently shown by many individuals and groups are expected to have lasting effects on water-project planning, construction, and operations. Developing water while protecting the environment will require greater objectivity by and cooperation between engineers, ecologists, sociologists, politicians, special-interest groups, and others, as well as greater willingness to deal with complexities. (Knapp-USGS) W72-08086

WHOLESALING ENVIRONMENTAL SER-

VICES, Maryland Environmental Service, Annapolis. For primary bibliographic entry see Field 06E. W72-08161

ENVIRONMENTAL SPOILAGE IN THE USSR. Aston Univ., Birmingham (England). Dept. of Industrial Administration.
For primary bibliographic entry see Field 05B. W72-08192

ECOLOGICAL MODELS: A STATUS REPORT, British Columbia Univ., Vancouver. Inst. of Animal Resources and Ecology.
For primary bibliographic entry see Field 06A. W72-08259

THE USE OF MODELS IN PRACTICAL RESOURCE MANAGEMENT, Montreal Engineering Co. Ltd. (Quebec). For primary bibliographic entry see Field 06A. W72-08262

KAWAIHAE HARBOR FOR LIGHT-DRAFT VESSELS, HAWAII COUNTY, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT). Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div. For primary bibliographic entry see Field 08A. W72-08313

WATERSHED FIELD INSPECTIONS-1971. Committee on Public Works (U. S. House). Subcommittee on Conservation and Watershed. For primary bibliographic entry see Field 04A. W72-08320

ENVIRONMENTAL AWAKENING-MESSAGE FROM THE PRESIDENT OF THE UNITED STATES, For primary bibliographic entry see Field 06E.

UNITED STATES PORTION OF RETAMAL IN-TERNATIONAL DIVERSION DAM AND UNITED STATES DIKE, LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT). International Boundary and Water Commission, El Paso, Tex. For primary bibliographic entry see Field 08A.

SMALL-BOAT HARBOR, MISSISSIPPI RIVER AT PEPIN, WISCONSIN (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 08A.

CLINTON LAKE, WAKARUSA RIVER, KAN-SAS (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 08D. W72-08329

NEW LONDON HURRICANE PROTECTION PROJECT, NEW LONDON, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATE-Corps of Engineers, Waltham, Mass. New England Div. For primary bibliographic entry see Field 08D.

MILL CREEK LAKE, MILL CREEK, SCIOTO RIVER BASIN, DELAWARE AND UNION COUNTIES, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va For primary bibliographic entry see Field 08A. W72-08331

MARTIN CHANNEL IMPROVEMENT PRO-JECT, BEAVER CREEK, LEVISA FORK OF BIG SANDY RIVER, KENTUCKY (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va For primary bibliographic entry see Field 04A. W72-08332

CRYSTAL DAM, RESERVOIR, AND POWER PLANT, CURECANTI UNIT, COLORADO RIVER STORAGE PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A. W72-08333

ARCHER-WELD 230-KV TRANSMISSION LINE AND WELD SUBSTATION, COLORADO RIVER STORAGE PROJECT, COLORADO (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Denver, Colo For primary bibliographic entry see Field 08C. W72-08334

WASTE WATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR NASSAU AND SUFFOLK COUNTIES, NEW YORK (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, New York. For primary bibliographic entry see Field 05D. W72-08335

NIBLACK LEVEE (PUMPING PLANTS), WABASH RIVER, INDIANA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky. For primary bibliographic entry see Field 08C. W72-08336

LEAD-DEADWOOD SANITARY DISTRICT NO.

1, SOUTH DAKOTA, PROJECT NO. WPC SD-200 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Environmental Protection Agency, Denver, Colo. For primary bibliographic entry see Field 05D.

Field 06-WATER RESOURCES PLANNING

Group 6G—Ecologic Impact of Water Development

TAYLORSVILLE LAKE, SALT RIVER, KEN-TUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky. For primary bibliographic entry see Field 08A.

YOLO COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, APPLICATION UNDER THE SMALL RECLAMATION PROJECTS ACT (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A.

LOST RIVER WATERSHED PROJECT, INDI-ANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.

W72-08340

GOOSE CREEK, SOMERSET COUNTY, MARY-LAND (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 04A. W72-08341

WHITNEY LAKE, BRAZOS RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATE-

Army Engineer District, Fort Worth, Tex. For primary bibliographic entry see Field 04A. W72-08342

TIOGA-HAMMOND LAKES PROJECT, TIOGA COUNTY, PENNSYLVANIA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 08D. W72-08343

TASKINAS CREEK, JAMES CITY COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT

STATEMENT). Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 04A. W72-08344

THE PRESIDENT'S 1971 ENVIRONMENTAL

Council on Environmental Quality, Washington,

For primary bibliographic entry see Field 06E. W72-08352

AN AESTHETIC OVERVIEW OF THE ROLE OF WATER IN THE LANDSCAPE, California Univ., Berkeley. Dept. of Landscape

Architecture.
For primary bibliographic entry see Field 06B.

NEW YORK DEPARTMENT OF ENVIRON-MENTAL CONSERVATION-FOREST SERVICE COOPERATIVE CYPSY MOTH SUPPRESSION PROJECT 1971 (FINAL ENVIRONMENTAL IM-PACT STATEMENT).

Forest Service, (USDA) Washington, D.C. For primary bibliographic entry see Field 05C.

SAN MARCOS NATIONAL FISH HATCHERY, HAYS COUNTY TEXAS (FINAL ENVIRON-MENTAL IMPACT STATEMENT).
Bureau of Sport Fisheries and Wildlife, Washing-

For primary bibliographic entry see Field 08I. W72-08449

07. RESOURCES DATA

7A. Network Design

TESTS FOR SYSTEMATIC ERRORS IN ANAL-YSIS, (IN GERMAN), Badische Anilin- and Soda-Fabrik A.G., Lud-wigshafen am Rhein (West Germany). R. Kaiser.

Zeitschrift fur Analytische Chemie, Vol. 256, No. 1, p 1-6, August 31, 1971. 7 fig, 5 ref. English sum-

Descriptors: *Analytical techniques, *Quality control, *Chemical analysis, Evaluation, Trace elements, Data collections, Sampling, Separation

ments, Data colections, Sampling, Separation techniques, Methodology, Estimating.

Identifiers: "Systematic error, "Quantitative analysis, Errors, Method evaluation, Error sources, Method validation, Balance test.

Systematic errors are most important in trace analysis, since the sampling error and the error caused by limited knowledge about the total sample composition are dominant. To get correct results a high yield of analytical information and good repeata-bility are necessary, but not sufficient. Two methods of detecting systematic errors are: (1) determination of the limits of the analytical method by testing the change of results versus change of measurement parameters and (2) the balance test. In the second case the sample is quantitatively decomposed in parts with differing concentrations of the compound, i, to be measured. The absolute amount of i is measured in all parts and balanced with the amount in the prime sample. The procedure can also be used for determining analytical errors in continuous processes. (Snyder-Battelle) W72-07902

HIERARCHICAL SYSTEMS: CITIES, RIVERS, ALPINE GLACIERS, BOVINE LIVERS, AND TREES, Harvard Univ., Cambridge, Mass. Graduate

School of Design.
For primary bibliographic entry see Field 04A.
W72-08434

7B. Data Acquisition

ANALYTICAL STUDY OF A CADMIUM ION--SELECTIVE CERAMIC MEMBRANE ELEC-

TRODE,
Matsushita Electric Industrial Co. Ltd., Osaka (Japan). Wireless Research Lab. For primary bibliographic entry see Field 05A. W72-07904

MEASUREMENT OF CURRENTS IN LAKE MEAD WITH THE DEEP WATER ISOTOPIC CURRENT ANALYZER (DWICA), Bureau of Reclamation, Denver, Colo. J. J. Sartoris, and D. A. Hoffman. Report REC-ERC-71-38, 17 p, 14 fig, 1 tab, 3 ref, Oct 1971.

Descriptors: *Currents (Water), Density currents, Deep water, Field investigations, Radioisotopes, *Current meters, Water pollution, Water quality, Density stratification, Iodine radioisotopes, Flow characteristics, *Reservoirs, *Water temperature, Thermal stratification, Path of pollutants, Salinity,

Inflow.

Identifiers: *Deep Water Isotopic Current
Analyzer, *Current patterns, Lake Mead,
Southern Nevada Water Project (Nev).

In Nov 1967, a Deep Water Isotopic Current Analyzer (DWICA) was used to study current pat-terns in the Boulder Basin of Lake Mead to deter-

mine whether low-quality water from Las Vegas Bay might enter the Southern Nevada Water Project intake on Saddle Island. Secondary objectives were to study the general patterns in Boulder Basin and the effect of power discharges at Hoover Dam on these currents. Results of current measurements at 3 stations in Boulder Basin are given. Observations indicate a definite possibility that low-quality water from Las Vegas Bay might enter the water intake on Saddle Island. Current measurements off Promontory Point show a correlation between power discharges at Hoover Dam and current velocities in this area. Peak current velocity lags the discharge peak by about 2 hr. Suggestions for further study of general current patterns (USBR) atterns in Boulder Boulder Basin are included.

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RHEOLOGICAL EQUATION OF A SILT, DETERMINED WITH THE AID OF A NEWLY DEVELOPED TEST APPARATUS, Institute for Soil Mechanics and Foundation Engineering, Kassel (West Germany).
For primary bibliographic entry see Field 02G.
W72-07956

A PRACTICAL METHOD OF DETERMINING WATER CURRENT VELOCITIES AND DIFFU-SION COEFFICIENTS IN COASTAL WATERS BY REMOTE SENSING TECHNIQUES, Texas A and M Univ., College Station. Dept. of Civil Engineering. For primary bibliographic entry see Field 05B. W72-07970

USE OF RAIN GAGES TO ADJUST RADAR ESTIMATES OF RAINFALL, Center for the Environment and Man, Inc., Hartford, Conn. For primary bibliographic entry see Field 02B. W72-07973

AUTOMATED DELINEATION OF WETLANDS IN PHOTOGRAPHIC REMOTE SENSING, Gruman Aerospace Corp., Bethpage, N.Y. Research Dept. For primary bibliographic entry see Field 07C. W72-07974

STUDY OF FILTRATION RATES LEDOVANIYE STABIL'NOSTI FIL'TRATSION-NOGO POTOKA VO VREMENI), Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02G. W72-08072

AUGER-HOLE HYDRAULIC CONDUCTIVITY: FIRST VERSUS SECOND TEST, Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 02G. W72-08084

PRELIMINARY FIELD STUDIES USING EARTH RESISTIVITY MEASUREMENTS FOR DELINEATING ZONES OF CONTAMINATED GROUND WATER. Federal Water Pollution Control Administration,

Cincinnati, Ohio. Ohio Basin Region For primary bibliographic entry see Field 05B. W72-08109

A SIMPLE, TENSION-FREE LYSIMETER. Puerto Rico Nuclear Center, Rio Piedras. For primary bibliographic entry see Field 02G. W72-08111

A RAPID METHOD OF SOIL MOISTURE DETERMINATION, Punjab Agricultural Univ., Hissar (India). For primary bibliographic entry see Field 02G. W72-08130

BATHYTHERMOGRAPH DEVICE, Buzzards Bay Corp., Marion, Mass.

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U. S. Patent No. 3,520,188, 3 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office Vol. 876, No. 2, p. 440, July 14, 1970.

Descriptors: *Patents, *Bathythermographs, Instrumentation, Depth, Water temperature, Measurement, *Water properties.

A bathythermograph for use from a submerged vessel is described. This measurement device includes a chamber having a positive buoyancy af-fixed to the probe by a pressure responsive mechanical latch, so that the probe is unlatched from the chamber at the depth of the vessel, and is released from the chamber at a lesser depth for descent in the water. The electric sensing equipment detects the properties of the water. (Sinha-OEIS) W72-08173

BATHOMETER, TRW Inc., Redondo Beach, Calif. (Assignee). R. H. Douglass, Jr.

U. S. Patent No. 3,512, 408, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office Vol. 874, No. 3, p. 756, May 19, 1970.

Descriptors: *Patents, Water temperature, *Water properties, *Bathymetry, Measurement, Instru-mentation, Sea water. Identifiers: *Bathometers.

A self-contained bathometer system capable of sensing, recording and transmitting data on sea water properties or characteristics is provided. It has a housing for electronic equipment. There are predetermined centers of buoyancy and mass, a pictisonable ballast of sufficient weight to sub-merge the housing to a predetermined depth, and one or more sensors for determining the water pro-perties. (Sinha-OEIS) W72-08181

MAPPING GROUND WATER BY USING ELECTRICAL RESISTIVITY WITH A BURIED CUR-RENT SOURCE, Pennsylvania State Univ., University Park. Dept.

of Geosciences. For primary bibliographic entry see Field 02F. W72-08184

INSTRUMENTATION EFFECTS ON ERRORS IN NUCLEAR METHODS FOR SOIL WATER AND DENSITY DETERMINATION, Oklahoma State Univ., Stillwater. Dept. of

Agronomy. For primary bibliographic entry see Field 02G. W72-08209

SOURCE-DETECTOR GEOMETRY EFFECT ON NEUTRON PROBE CALIBRATION, Oklahoma State Univ., Stillwater. Dept. of Agronomy. For primary bibliographic entry see Field 02G. W72-08212

FRACTIONAL WATER-SEDIMENT SAMPLER, Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 02J.
W72-08216

MODELLING TECHNIQUES IN WATER RESOURCES SYSTEMS.
For primary bibliographic entry see Field 06A.
W72-08258

MATHEMATICAL MODELS OF HYDROLOGIC SYSTEMS, University Coll., (Ireland). Dept. of Civil Engineering, Dublin (Ireland). Dept. of Civil gineering, Dublin (Ireland). For primary bibliographic entry see Field 06A. W72-08269

7C. Evaluation, Processing and Publication

SOME CANONS OF SOUND EXPERIMENTA-

TION, National Bureau of Standards, Washington, D. C. Statistical Engineering Lab. C. Eisenhart.

C. Eisennarr. Journal of Quality Technology, Vol. 4, No. 1, p 20-23, January 1972. 4 tab. Excerpted from Some Canons of Sound Experimentation by Churchill Eisenhart, presented at the 31st Session of the In-ternational Statistical Institute in 1958.

Descriptors: Design, Model studies, *Quality control, Efficiencies, *Measurement, Analytical techniques, *Statistical methods. Identifiers: Experimental design, *Data interpreta-

An example of sound experimentation shows that: (1) statistical methods can be used when limited data are available, (2) information can be obtained on the precision and accuracy of a measurement process without making numerous measurements of any single magnitude, and (3) in routine work, useful auxiliary information on personnel, equip-ment, etc. is obtainable at little or no extra cost, by killful design of the measurements methods. (Mackan-Battelle)
W72-07889

NEW POSSIBILITIES OF ANALYSIS BY COM-BINATION OF DIRECT QUANTITATIVE THIN-LAYER CHROMATOGRAPHY AND ELEC-TRONIC DATA PROCESSING, (IN GERMAN), Schering A.G., Bergkamen (West Germany). Zen-trale Analytik Werk Wolfenbuttel. For primary bibliographic entry see Field 05A. W72-07912

WATER WELLS AND SPRINGS IN IVANPAH VALLEY, SAN BERNARDINO COUNTY, CALIFORNIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02F.

SIMPLE METRIC SEDIMENTARY STATISTICS USED TO RECOGNIZE DIFFERENT ENVIRON-

MENTS, Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center. For primary bibliographic entry see Field 02J. W72-07969

AUTOMATED DELINEATION OF WETLANDS IN PHOTOGRAPHIC REMOTE SENSING, Gruman Aerospace Corp., Bethpage, N.Y. Research Dept.

Research Dept.
W. G. Egan, and M. E. Hair.
Available from NTIS, Springfield, Va. 22151 as
AD-726 142, \$3.00 in paper copy, \$0.95 in
microfiche. Memorandum RM-509J, June 1971. 19
p, 16 fig, 1 tab, 10 ref. Paper presented at 7th International Symp on Remote Sensing of Environment, Ann Arbor, Mich, May 17-21, 1971.

Descriptors: *Remote sensing, *Aerial photography, *Wetlands, *Photogrammetry, *Data

processing, Mapping, Digital computers, Terrain analysis, Maryland, Automation.

Precision automated photometric mapping of wet-lands in Calvert County, Maryland was achieved by using aerial color film (both true color and false color infrared) for data collection, calibration, and control. Recognition appears to be most accurately achieved by microdensitometric analysis of the true color transparency in a narrow band centered in the red, on 3000-foot altitude imagery. A com-puter-generated map was obtained. (Knapp-USGS) W72-07974

GREAT LAKES ICE ATLAS, Lake Survey Center, Detroit, Mich. For primary bibliographic entry see Field 02C. W72-07975

MODELS FOR MANAGING METROPOLITAN SURFACE WATER SYSTEMS, Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center. For primary bibliographic entry see Field 06A. W72-07996

MATHEMATICAL PROGRAMMING FOR RE-GIONAL WATER QUALITY MANAGEMENT, California Univ., Los Angeles. School of Busi-

For primary bibliographic entry see Field 05G. W72-07998

NONUNIFORM FLOW FUNCTIONS CIRCULAR

Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08B. W72-08070

NUMERICAL FORECAST AND ANALYSIS OF HYDROMETEOROLOGICAL FIELDS IN THE ARCTIC (CHISLENNYY PROGNOZ I ANALIZ GIDROMETEOROLOGICHESKIKH POLEY V

ARKTIKE). Arkticheskii Antarkticheskii Nauchno-Iss-Handledskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02B. W72-08079

APPLICATION OF DIGITAL COMPUTERS TO HYDRAULIC COMPUTATION OF THE RELATIONSHIP BETWEEN WATER LEVELS AND DISCHARGES IN RIVER DELTAS (GIDRAVLICHESKIY RASCHET SVYAZEY MEZHDU RASKHODAMI I UROVNYAMI V DEL'TAKH REK NA ETSVM), Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02E. W72-08080

PREDICTING SURFACE RUNOFF FROM AGRICULTURAL WATERSHEDS, Iowa State Univ., Ames. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 02A. W72-08082

WATER RESOURCES INVESTIGATIONS IN ARKANSAS, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 7 fig, 1 map.

Descriptors: "Water resources, "Investigations, *Arkansas, "Interagency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.

Field 07—RESOURCES DATA

Group 7C-Evaluation, Processing and Publication

Identifiers: *Cooperative water-studies program, Research programs.

water resources studies and investigations of the U.S. Geological Survey in Arkansas are sum-marized. A selected bibliography of material con-cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 118 primary, secondary, and water management streamflow stations; 1,368 groundwater observation wells; and 35 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average an-nual runoff, discharge of the principal rivers, and the dissolved solids in ground and surface waters. A map, scale 40 mi to the in, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Arkansas in September 1968. (Woodard-USGS)

WATER RESOURCES INVESTIGATIONS IN FLORIDA, 1969. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 4 fig, 1 map.

Descriptors: *Water resources. *Investigations. *Inter-agency cooperation, *Florida, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.

Identifiers: *Cooperative water-studies program,

Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Florida are summarized. A selected bibliography of material con-cerning the State is included. A list is given of State and Federal agencies, counties, and cities, who cooperate in different parts of the program. The hydrologic data network consists of 203 primary, secondary, and water management streamflow stations; 908 groundwater observation wells; and 217 water quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, and the dissolved solids in ground and surface waters. A map, scale 16 mi to the in, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Florida in June 1969. (Lang-W72-08091

WATER-RESOURCES APPRAISAL OF THE PILOT CREEK VALLEY AREA, ELKO AND WHITE PINE COUNTIES, NEVADA, Geological Survey, Carson City, Nev. For primary bibliographic entry see Field 04B. W72-08092

HYDROLOGY OF THE GLENN CREEK WATERSHED, TANANA RIVER BASIN, CEN-TRAL ALASKA Cold Regions Research and Engineering Lab.,

Hanover, N.H. For primary bibliographic entry see Field 02A. W72-08095

HANDLING WATER BY COMPUTER. Salt River Project, Phoenix, Ariz. For primary bibliographic entry see Field 03F. W72-08128

GRAPHICAL INTERPRETATION OF WATER--QUALTIY DATA, Wisconsin Univ., Madison. Dept. of Geology and Geophysics. For primary bibliographic entry see Field 02K. W72-08183

MAPPING GROUND WATER BY USING ELEC-TRICAL RESISTIVITY WITH A BURIED CUR-

Pennsylvania State Univ., University Park. Dept. of Geosciences. For primary bibliographic entry see Field 02F. W72-08184

FACTORS AFFECTING THE VALIDITY OF CHEMICAL ANALYSES OF NATURAL

New Mexico Inst. of Mining and Technology, Socorro. For primary bibliographic entry see Field 02K. W72-08185

ANALYSIS OF PROBABILITY AND RISK EQUATIONS.

Ministry of Natural Resources, Sokoto (Nigeria). For primary bibliographic entry see Field 04A. W72-08194

CHANCE, UNCERTAINTY, AND TRUTH IN SCIENCE

National Bureau of Standards, Washington, D.C. W. J. Youden.

Journal of Quality Technology, Vol. 4, No. 1, p 7-10, January 1972. 3 tab, 5 ref. Reprinted from The Science Teacher, Vol 35, No. 8, November 1968.

Descriptors: Design, *Quality control, Analytical *Probability, *Risks.
Identifiers: *Chance, Randomization replication,

Null hypothesis, Confounding, Bias, Significance, Local control, Interference, Experimental design, Performance evaluation, Validation, *Data interpretation, Errors.

Valid experimental conclusions depend upon proper design of experiments and accurate interpretation of experimental results. Concepts such as randomization, replication, null hypothesis, confounding, bias, significance, local control, and basis for interference (all of which are defined) are employed for these purposes. Several well-known examples show how faulty design or misinterpretation of data yield incorrect or limited conclusions. Suggestions are given for sound experimental design and data evaluation. (Mackan-Battelle) W72-08222

THE EVOLUTION OF DESIGNED EXPERI-

MENTS, National Bureau of Standards, Washington, D.C. W. J. Youden.

Journal of Quality Technology, Vol. 4, No. 1, p 11-19, January 1972. 7 fig, 4 ref. Presented at the second session of the IBM Scientific Computing Symposium on Statistics on Oct 21, 1963, Published by the IBM Data Processing Division in White Plains, N.Y., in 1965.

Descriptors: *Design, *Quality control, Measure-ment, *Statistical methods, Analytical techniques. Identifiers: *Experime..tal design, *Errors, *Data interpretation.

An historical continuum of experimental designs with evaluation of their advantages and drawbacks is presented. Experimental design must fit the particular requirements of the science, the problem, and the experimental environment. An investigator must confirm results or errors reported by earlier workers and arrive at realistic estimates of the experimental errors in their work. (Examples are given.) Designs based on these precepts are directed toward more efficient study of sources of error. An active area of experimental design is in obtaining objective estimates of measurement errors. (Mackan-Battelle) W72-08223

THE FALLACY OF THE BEST TWO OUT OF

Journal of Quality Technology, Vol. 4, No. 1, p 24, January 1972. 1 tab. Reprinted from Technical News Bulletin of the National Bureau of Standards Inly 1949

Descriptors: *Quality control, Efficiencies, *Measurement, *Statistical methods, Analytical techniques, Probability, *Frequency analysis,

Sampling.
Identifiers: Confidence limits, Errors, Experimental design, Triad data, Theoretical frequency, Variance

Multiple measures have 2 principal advantages: their concordance reveals precision of measurement, and they provide average measurements of greater precision than one measurement. Due to uncertainty of precision, measurements used in new situations should be averaged instead of using the best 2 out of 3 approach. Two measurements may not give a reliable estimate of their precision. Three measurements are the minimum number which can be used to reveal an unreliable condition in a new situation. Statistical data, which show how different the third measurement may be before it should be suspected of real significance, reveal that in an average of one out of every 12 sets of 3 measures, one of the measurements be at least 19 times farther away from its neighbor than the difference separating the two closest. This suggests that measurements often dropped should be retained. (Mackan-Battelle) W72-08224

MAKING ONE MEASUREMENT DO THE

National Bureau of Standards, Washington, D.C. W. J. Youden, and W. S. Connor. Journal of Quality Technology, Vol. 4, No. 1, p 25-28, January 1972. 6 ref. Reprinted from Chemical Engineering Progress, October 1953.

Descriptors: *Quality control, *Measurement, Sampling, Statistical methods, Probability, methods, Probability, Sampling, Statistica Analytical techniques. Identifiers: Evaluation, Remeasurement, Variance, Experimental design, Performance evalua-

Frequently measurements are made under condi-

tions which are either hard to specify precisely or difficult to hold constant for any considerable period. Corrections for drifts or shifts arising from these uncontrolled conditions are often based on measurements made upon control or standard samples periodically introduced in the work schedule. These standard samples make possible the adjustment of the measurements on the test samples at the price of diverting effort that might otherwise be spent on test samples. The standard samples may be dispensed with by picking out certain ones of the test samples for measurement at a later time. Some schedules for the selection of test samples for remeasurement are presented. When the schedule possesses a balanced symmetry the arithmetical operations for adjusting the observations become simple and easy. Furthermore, all the measurements made contribute information on the test sample. (Mackan-Battelle) W72-08225

GRAPHICAL DIAGNOSIS OF INTERLABORA-

TORY TEST RESULTS, National Bureau of Standards, Washington, d. c. W. J. Youden.

Journal of Quality Technology, Vol. 4, No. 1, p 29-33, January 1972. 4 fig, 2 tab. Reprinted from In-dustrial Quality Control, Vol. 15, No. 11, May

Descriptors: Analytical techniques, Measurement, Statistical methods, Evaluation, Quality control, *Laboratory tests, *Testing procedures. Identifiers: *Graphical analysis, Double sample procedures, *Data interpretation, Performance evaluation, *Errors, Interlaboratory comparisons.

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Analysis of interlaboratory test results should Analysis of interlaboratory test results should either show whether a test procedure is capable of yielding acceptable results or, if the results are unacceptable, should indicate what is wrong with the procedure. The double sample graphical method will provide these results. The procedure involves sending two different materials to a number of laboratories for testing. A graph is then prepared from the paired results. Preparation of the graph is described. The overall results of the experiment can be ascertained by analyzing the graphs. This procedure offers several advantages: graphs. This procedure offers several advantages: (1) a light burden is imposed on each laboratory, (2) presentation of results is facilitated, (3) no statistical background or computer analysis is necessary to show constant errors or deviations, and (4) the efficiency of the laboratory and the direction for improvement are clearly indicated. (Mackan-Battelle) W72-08226

UNCERTAINTIES IN CALIBRATION,

National Bureau of Standards, Washington, D.C. W. J. Youden.

Journal of Quality Technology, Vol. 4, No. 1, p 34-39, January 1972. I fig. Presented at the 1962 International Conference on Precision Electromagnetic Measurements as Paper No. 3.1.

Descriptors: *Measurement, *Quality control, *Calibrations, Statistical methods, Analytical

Calibrations, Statistical methods, Analytical techniques, *Risks. Identifiers: Precision, Standards, Errors, *Data interpretation, Interlaboratory comparisons, Experi-

Some methods for comparison between standards and items undergoing calibration are presented.
The purpose is to gather data, which will allow objective estimates of the precision of a test or instrument and that are also useful in detecting sources of systematic errors. This purpose can be achieved by the use of some standard statistical designs in the scheduling of the work program. The problems of stating the uncertainty and of combining these uncertainties in a chain of calibra-tions are discussed. (Mackan-Battelle)

SETS OF THREE MEASUREMENTS,

National Bureau of Standards, Washington, D.C. W. J. Youden.

Journal of Quality Technology, Vol. 4, No. 1, p 40-44, January 1972. 4 ref. Reprinted from The Scien-tific Monthly, Vol. 77, No. 3, September 1953.

Descriptors: Analytical techniques, *Measure-ment, *Quality control, Statistical methods, ment, *(Sampling. Identifiers: *Triad data, *Data interpretation,

Method evaluation, Bias, Experimental design.

Single measurements have meaning only when they can be compared to a standard. A second measurement allows calculation of an average which indicates a magnitude in connection with a scientific problem, but does not indicate errors in measurement or procedure. The use of a third measurement reintroduces margins of error, decreases the bias, and may include essential variations inherent in the design procedure and control. A triad of data increases the average precision of measurement evaluation. It has been found that 95 percent of sets of 3 measurements have an overall range not exceeding 2.96 times the average difference for a pair of measurements. Sets meeting this requirement may be freed from suspicion and the average of the 3 results may be taken as best representing the quantity sought. (Mackan-Battelle) W72-08228

STATISTICAL ASPECTS OF ANALYTICAL DETERMINATIONS, National Bureau of Standards, Washington, D.C. W. J. Youden.

W. J. Youden.
Journal of Quality Technology, Vol 4, No 1, p 4549, January 1972. 6 tab, 2 ref. Reprinted from The
Analyst, the Journal of the Society of Public
Analysts and Other Analytical Chemists,
December 1952, Vol 77, No 921, p 874-878.

Descriptors: *Statistical methods, Measurement, *Quality control. Identifiers: Data presentation, *Data interpreta-

The detection and correction of sources of error in analytical procedures is a major concern of analytical chemists. The efficiency of the search for the sources of analytical errors can be increased by scheduling the order of making the determinations so that the determinations fall into rational groupings. Two new types of groupings are presented. These groupings have features that are expected to make them more useful to investigators than groupings previously available. (Mackan-Battelle) W72-08229

USE OF INCOMPLETE BLOCK REPLICA-TIONS IN ESTIMATING TOBACCO-MOSAIC VIRUS, National Bureau of Standards, Washington, D.C.

National Butter of Standards, Washington, D.C.

Journal of Quality Technology, Vol 4, No 1, p 5057, January 1972. 1 fig, 3 tab, 4 ref. Reprinted from
Contributions from Boyce Thompson Institute,
Vol 9, No 1, p 50-57, 1937.

Descriptors: *Statistical methods, Analytical techniques, Design, Evaluation, Tobacco, Microbiology, Microorganisms, *Plant viruses. Identifiers: *Block replication, *Tobacco-Mosaic virus, *Nicotiana glutinosa, *Data interpretation,

The configuration of the modified incomplete blocks method of analysis permits construction of complete blocks of replication without sacrificing advantages of incomplete blocks. There is a resemblance of the design to the familiar Latin Square. The application allows simultaneous comparison of a large number of items to be tested while preserving the ability to estimate errors and analyze variances where they are present. The method is impeded only by restrictions on the size of block combinations and the total number of treatments possible. The design has been used on the study of tobacco-mosaic virus infectivity on N. glutinosa plant leaves. Necessary computation for the application of the analysis of variance to the data are included. (Mackan-Battelle) W72-08230

GUN PROBLEM ILLUSTRATES THE IM-PORTANCE OF PROPER SCHEDULING OF MEASUREMENTS,

National Bureau of Standards, Washington, D.C.

Journal of Quality Technology, Vol 4, No 1, p 58-59, January 1972. Reprinted from Industrial and Engineering Chemistry, Vol 47, No 8, August 1955, p 103A and 103B.

*Quality control, Evaluation, Descriptors: Statistical methods, Measurement.
Identifiers: *Randomization, *Reverse order,
Systematic order, Bias, Experimental evaluation,

Experimental design.

Disregard of the principles of statistical design may lead to inefficient experimentation and misleading results. This fact is demonstrated by a trial which involved the firing of 4 types of ammunition through a gun and recording the data concerning the rounds fired, i.e. velocity drop due to effect of barrel wear. Randomization of test sam-ples rather than biased selection was emphasized

because (1) a random order gives all rounds an equal chance in the firing order, consequently test-ing all positions fairly; (2) the separation between like rounds tends to be the same as unlike rounds, thereby allowing possible differences between the types of rounds to be observed. Another method sygested is a reverse order design. With systematic order, barrel wear has the largest effect on the averages and a minimum effect on the agreement of duplicate rounds. With the reverse order, barrel wear does not disturb the averages but does introduce maximum disagreement between duplicate rounds. Random order avoids both extremes by apportioning barrel effect equally on averages and on duplicate results. (Mackan-Bat-W72-08231

COMPUTER ANALYSIS OF WATER DISTRIBUTION SYSTEMS: PART II - NUMERICAL

Medical Univ. of South Carolina, Charleston. Dept. of Biometry.
For primary bibliographic entry see Field 04A.
W72-08254

MODELLING TECHNIQUES IN WATER RESOURCES SYSTEMS.
For primary bibliographic entry see Field 06A.
W72-08258

DIGITAL SIMULATION OF THE UPSTREAM MOVEMENT OF MIGRATORY SALMONIDS, Water Resources Board, Reading (England) For primary bibliographic entry see Field 06A. W72-08260

ENVIRONMENTAL SIMULATION AND POL-ICY FORMULATION: METHODOLOGY AND EXAMPLE (WATER POLICY FOR BRITISH COLUMBIA), British Columbia Univ., Vancouver. Dept. of

Mathematical Ecology.
For primary bibliographic entry see Field 06A. W72-08261

SIMULATION OF THE ANNUAL ECOLOGI-CAL CYCLE OF BENTHIC MARINE PLANTS-EELGRASS IN IZEMBEK LAGOON, ALASKA, Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-08263

COMPUTER SIMULATION OF SPATIAL DISTRIBUTION PATTERNS, Auckland Univ. (New Zealand). Dept. of Zoology. For primary bibliographic entry see Field 06A.

RUNHYDROGRAPHS-A NEW CONCEPT ON HYDROGRAPH GENERATION, Natal Univ., Durban (South Africa). Dept. of Civil

Engineering. For primary bibliographic entry see Field 06A. W72-08270

CONCEPTUAL MODELS FOR THE TRANSFORMATION OF PRECIPITATION INTO

Societe Grenobloise d'Etudes et Applications Hydrauliques, Grenoble (France). For primary bibliographic entry see Field 06A. W72-08271

FLOOD OF JANUARY 1969 NEAR VENTURA, CALIFORNIA, Geological Survey, Washington, D.C. J. A. Singer, and M. Price.

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

For sale by USGS, Washington, D.C. 20402, Price \$1.00. Geological Survey Hydrologic Investiga-tions Atlas HA-423, 1 sheet, 1971. 5 fig, 1 map, 2

Descriptors: *Floods, *Streamflow, *Peak discharge, *California, Historic floods, Flood profiles, Flood damage, Flood frequency, Flood recurrence interval, Stream gages, Flood control, Reservoirs, Hydrologic data, Flow rates.

Identifiers: *Ventura (Calif), Hydrologic atlas.

Unprecedented floodflows occurred in the Ventura River basin in California on January 25, 1969, as a result of heavy storms. The maps and graphs of this 1-sheet atlas (29 x 49 in) show the results of the extent and frequency of the flood. The storms of January 18-21 and 24-26 produced extremely heavy precipitation in the mountain areas. Total precipitation during the storm periods averaged 25 inches over the basin, but ranged from 10 inches in the coastal area to more than 40 inches in the Matilija Creek canyon 5 miles northwest of Matilija Hot Springs. The precipitation quantities of the two storm periods were comparable. The crest stage of 24.30 feet on January 25, 1969, at the gaging station on Ventura River near Ventura was gaging station on Ventura River near ventura was 5.1 feet higher than the previous maximum recorded stage which occurred on March 2, 1938; the corresponding discharge was 1.5 times the prior maximum flow of record. (Woodard-USGS) W72-08406

AVAILABILITY AND USE OF WATER IN NEBRASKA, 1970, Geological Survey, Lincoln, Neb. For primary bibliographic entry see Field 06D.

WATER RESOURCES INVESTIGATIONS IN KENTUCKY, 1972. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1972. 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Kentucky, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water quality, Water level fluctuations, Bibliogra-phies, Networks, Maps.

phies, Networks, maps. Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Kentucky are sum-marized. A selected bibliography of material con-cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 233 primary, secondary, and water management stream-flow stations; 141 groundwater observation wells; and 169 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, mean annual runoff, surface water. A map, scale approximately 27 mi to the inch, shows by symbols, numbers, and collored outline the hydrologic data network and investigations in Kentucky in January 1972. (Woodard-USGS) discharge of principal rivers, and chemical type of

WATER RESOURCES INVESTIGATIONS IN MASSACHUSETTS, 1968. Geological Survey, Washington, D.C.

Geological Survey, Washington, D.C.

Descriptors: *Water resources, *Investigations, *Massachusetts, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections,

Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in Massachusetts are sumarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 90 primary, secondary, and water management streamflow stations; 91 groundwater observation wells; and 21 water quality observing sites. Small State maps water quanty observing sites. Small State maps show mean annual precipitation, average annual runoff, and average discharge of principal rivers. A map, scale 16 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Massachusetts in December 1968. (Woodard-USGS)

SELECTED TERMS IN FISH CULTURE. Food and Agriculture Organization of the United Nations, Rome (Italy). Terminology and Reference Section.

Terminology Bulletin No 19, January 1972, 106 p.

Descriptors: *Fish types, *Fish diseases, *Translations, *Indexing, Bibliographies, Fish, Documentation. Identifiers: *Fish terminology, Language translations, English, French, Spanish.

This bulletin contains 1,019 terms drawn from Pood and Agriculture Organization (FAO) documents. Other sources are listed in the bibliography. The terms are listed in alphabetical English order, consisting of numbered English main entries with their French and Spanish equivalents. The names of the more important species of fish as well as of of the more important species of fish as well as of the diseases most frequently encountered in fish culture are included. The bulletin has English, French, Spanish, and Latin indexes. Each term refers to the numbered English main entry. Many are compound terms which have become fixed expressions in linguistic use. The English, French, and Spanish Translation Groups, as well as the Editorial Section of the Publications Division have participated in reviewing this bulletin with the aim of establishing terminological consistency. (Woodard-USGS)
W72-08414

LIMNOLOGICAL DATA FROM LAKE ST. CLAIR, 1963 AND 1965, National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab. For primary bibliographic entry see Field 02H. W72-08415

THE CASPIAN (KASPIYSKOYE MORE. BIBLIOGRAPHY, (KASPIYSKOYE MORE. REFERATIVNYY SBORNIK), Akademiya Nauk SSSR, Moscow. Vsesoyuznyi

For primary bibliographic entry see Field 02H. W72-08424

08. ENGINEERING WORKS

8A. Structures

SEEPAGE THROUGH DAMS, Politekhnicheskii Institut, Leningrad (USSR). R.R. Chugaev.
In: Advances in Hydroscience, Academic Press,
New York, Vol. 7, V. T. Chow, editor, p 283-325,
38 ref, 1971. Descriptors: *Seepage, *Dams, *Earth dams, *Concrete dams, Seepage control. Identifiers: *Dam underseepage, *Electric analogy, Seepage models.

The following topics are discussed: (1) historical account of the development of the seepage theory in dam building, (2) basic types of seepage flow (permissible and impermissible), (3) main seepage problems, (4) fundamentals of theory of seepage in soil, (5) steady seepage beneath concrete dams and through earth dams, (6) seepage around concrete abutments, (7) seepage forces, and (8) Pavlovsky's experimental electric analogy method for seepage W72-07913

AUBURN DAM - WORLD'S LONGEST ARCH

DAM, Bureau of Reclamation, Denver, Colo.

A. T. Lewis.

Paper, American Society of Civil Engineers National Meeting on Water Resources Engineering, Atlanta, Ga., Jan 1972. 30 p, 6 fig.

Descriptors: *Arch dams, *Concrete dams, Dam design, Foundation rocks, Dam foundations, Stress analysis, Geology, Field investigations, In situ tests, Outlet works, California, Diversion tunnels, Instrumentation, Spillways, Penstocks, Powerplants, Structural models. Identifiers: *Auburn Dam (Calif), *Double-curvature arch dams.

Auburn Dam, the Bureau of Reclamation's third highest dam, will be the longest arch dam in the world. The double-curvature concrete arch dam world. The double-curvature concrete arch dam will be constructed on a highly complex foundation consisting of 5 distinct rock types, further complicated by numerous faults, shears, and jointing systems. The behavior of a dam on such a highly complex foundation is of particular interest. to Bureau engineers. Extensive instrumentation will be installed for measuring the service action of the dam. Model studies of the dam were made by Laboratorio Nacional de Engenharia Civil, Portugal, and spillway designs are being modeled in the Bureau laboratories. Investigations and designs for the Auburn Dam are described. Topics discussed include methods used to explore and determine the physical properties of the anisotropic foundation, foundation treatment, stress analy-sis, and appurtenances to the dam. The dam and powerplant will be constructed by multiple con-tracts, the first being awarded in May 1971. (USBR) W72-07923

ATLANTIC COAST OF LONG ISLAND, FIRE ISLAND INLET AND SHORE WESTERLY TO JONES INLET, NEW YORK, BEACH EROSION CONTROL AND NAVIGATION PROJECT, AT-LANTIC OCEAN AND GREAT SOUTH BAY, NEW YORK (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, New York.

Available from the National Technical Informa-tion Service as PB-202 146-F, \$3.00 in paper copy, \$0.95 in microfiche. April 1971. 21 p, 1 map, 7 append.

Descriptors: *Environmental effects, *Beach erosion, *Reservoir construction, *Navigation, *Erosion control, *Coastal engineering, Reservoirs, Froject planning, Recreation, Swimming, Recreation facilities, Boating, Shore protection, Beaches, Commercial fishing, Coasts, Fish populations, *New York.

Identifiers: *Environmental impact statements, *Long Island (N.Y.).

The project will provide beach erosion control and navigation improvements for Suffolk County along the South Shore of Long Island. The plan provides for a littoral reservoir and a rehandling basin which will connect the littoral reservoir to ocean deep water. The project area consists of a

barrier beach 1,500 to 3,000 feet wide and separated from the mainland by tidal bays. Implementation will result in increased commercial and sport fishing, enhancement of commercial and recreational navigation, prevention of beach ero-sion, and protection of nearby parkways and buildings. Adverse environmental effects are limited to the inconvenience to boat traffic, fishlimited to the inconvenience to boat traffic, fishing, and swimming activities during construction. Alternatives to the project include an off-shore breakwater or no development. The project enhances short term use, and no conflict is seen between short term goals and long term productivity. Irreversible commitments of resources are limited to construction labor and materials. Comments of concerned agencies are included. (Horwitz-Florida)

COUNCIL BLUFF RESERVOIR, POTOSI RANGER DISTRICT, CLARK NATIONAL FOREST, IRON COUNTY, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT). Forest Service (USDA), Milwaukee, Wis. Eastern For primary bibliographic entry see Field 04A. W72-08002

VALCOUR HARBOR, LAKE CHAMPLAIN, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Informa-tion Service as PB-204 256-F, \$3.00 in paper copy, \$0.95 in microfiche. November 19, 1971. 34 p, 3

Descriptors: *Environmental effects, *Break-waters, *Harbors, Project planning, Economic justification, Project life, Barriers, Recreation, Fishing, Boating, Construction, Water pollution control, Administrative agencies, Boats, Waste disposal, *New York.

Identifiers: *Environmental impact statements,

The project involves the construction of a 700foot-long rubble-mound offshore breakwater having an inshore depth of 4.5 feet and an offshore depth of 15 feet. The average depth at low lake level is 9.7 feet. Located on the west side of Lake Champlain, about five miles south of Plattsburgh, Champiain, about five miles south of Platisburgh, the project will provide a protected harbor for recreational boats, and a facility for sport fishing. The benefit to cost ratio is 2.8. Construction and operation of the project will not significantly affect fish and wildlife resources. No adverse effects are foreseen providing that regulations prohibiting the discharge of untreated sewage, mill wastes, rubbish, and other pollutants are enforced. The alternative to the project is no development. There is no conflict between local short term uses and long term productivity. No known irreversible or irretrievable commitments of resources are involved, other than construction labor. Comments of other agencies are included. (Horwitz-Florida) W72-08003

LOWER GRANITE LOCK AND DAM, SNAKE RIVER, WASHINGTON AND IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Walla Walla, Wash.

Available from the National Technical Informaston Service as PB-204 169-F, \$3.00 in paper copy, \$0.95 in microfiche. November 9, 1971. 158 p, 2 map, 7 photo, 1 dwg, 8 tab, 3 chart.

Descriptors: *Dam construction, *Hydroelectric Descriptors: "Dam construction, "Hydroelectric plants, "Wildlife habitats, "Fish populations, "En-vironmental effects, Navigation, Recreation, Flood control, Dams, Multiple-purpose projects, Navigable rivers, River systems, Project benefits, Project planning, Wildlife conservation, Impound-ments, Impounded waters, Flow control, Fish migrations, Levees, Highway relocation, Water resources development, Water quality control, "Washington, "Idaho. Identifiers: "Environmental impact statements,

*Snake River (Wash.).

The project involves construction of a dam, powerhouse, and navigation lock on the Snake River. The project would provide hydroelectric power, protect the city of Lewiston from flood damage, provide public outdoor recreational op-portunities, and complete the Lower Snake River navigation system to Lewiston. About forty-four miles of open, free-flowing natural river would be converted into a lake and approximately 3,260 acres of land now devoted primarily to dry grazing and other agricultural uses would be inundated and removed from production. Although the project would enhance long-term human productivity, it would have a considerable adverse impact on fish and wildlife resources. River flow characteristic can be utilized to assist in water quality manage-ment. In considering alternatives, it is necessary to note that ninety million dollars has already been invested in the project. Alternatives would be abandonment of the project or using a single-pur-pose project rather than the planned multiple-pur-pose project. Comments of interested agencies are set forth. (Brackins-Florida) W72-08004

CLIFTY CREEK LAKE, CLIFTY CREEK, WABASH RIVER BASIN, INDIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-202 658-F, \$3.00 in paper copy, \$0.95 in microfiche. September 1971. 21 p.

Descriptors: *Environmental effects, *Flood control, *Damsites, *Multiple-purpose reservoirs, Reservoir storage, Dam design, Flow control, Levees, River regulation, Flood protection, Water quality, Flow augmentation, Flow rates, Limnology, Aquatic environment, Lakes, Surface waters. gy, Aduatic environment, Lakes, Sutate Mater Land development, River basin development, Water management (Applied), *Indiana. Identifiers: *Environmental impact statements,

Wabash River Basin (Ind).

A multipurpose project consists of a dam and concomitant inundation of portions of Bartholomew and Decatur Counties, Indiana. The environmental impact of the proposed action includes: (1) improved flood control; (2) maintenance of adequate water quality through low flow augmentation, thus improving the limnological quality of the river; (3) improved land management programs; (4) alteration of aquatic habitat from lotic (free-flowing) to lentic (slack water;) (5) establishment of a slack water lake; (6) inundation of scenic waterfalls; and (7) improvement of general, fish, and wildlife recreation. Unavoidable adverse effects on the environment include: loss of wildlife habitat through inundation; conversion of free-flowing stream into a lake: and forced relocation of some area residents with a resulting sociological and psychological impact. Alternatives to the proposed action are flood plain zoing, acquisition of flood prone lands, levees, channel improvements, additional reservoir sites, and no development. Non-structural alternatives would not prevent damages to existing development. The structural alterna-tives were not found feasible or more detrimental to the environment. Comments of other agencies are included. (Blank-Florida)
W72-08005

SALT CREEK LAKE, SALT CREEK, SCIOTO RIVER BASIN, OHIO (FINAL ENVIRONMEN-TAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-202 654-F, \$3.00 in paper copy, \$0.95 in microfiche. April 30, 1971.65 p, 3 plate.

Descriptors: *Environmental effects, *Dam construction, *Reservoir construction, *Flood control, Surface waters, Aquatic habitats, Lakes, Wildlife habitats, Flood damage, Flood protection, Multiple-purpose projects, Flow augmentation, Water levels, Recreation, Regional development,

Identifiers: *Environmental impact statements, *Scioto River Basin (Ohio).

The proposed project will consist of the construc-tion and operation of a dam and other facilities for flood control, recreation, and fish and wildlife enhancement, with incidental redevelopment benefits in Ross and Vinton Counties, Ohio. The project will convert a reach of a non-regulated stream into a lake-type habitat. The conversion permit regulation of downstream flood and low flows, as well as alter the area's land use. Adverse effects include disruption of private and community land use, loss of some timber and agricultural lands, and elimination of certain types of biotic habitat. Alternatives considered include single-purpose developments or a combination of developments to provide equivalent services, local flood protection works, non-structural flood damage techniques such as zoning and floodproof-ing, recreational development of the stream, more intensive recreational development elsewhere, and no action. Project selection was based on potential to economically serve more facets of water resource management with the least complex administrative program. Comments of concerned agencies are included. (Kohla-Florida) W72-08006

COSUMNES RIVER DIVISION, INITIAL PHASE. CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Bureau of Reclamation, Washington, D.C.

Available from the National Technical INFOR-MATION Service as PB-202 185-F, \$3.00 in paper copy, \$0.95 in microfiche. August 30, 1971. 64 p, 1 map, 12 append.

Descriptors: *California, *Flood protection, *Water quality control, *Dam construction, *Environmental effects, Low-flow augmentation, Damsites, Detention reservoirs, Hydroelectric power, Flow rates, Vectors, Insects, Public health, Sediments, Turbidity, Water sports, Employments of the Protection o ployment opportunities, Fishing, Fisheries, Flood flow, Hunting, Project planning, Flood control. Identifiers: *Environmental impact statements, *Consumnes River (Calif.).

The project involves construction of three dams and storage reservoirs along the Consumnes River to provide flood protection and a dependable pattern of water supply for the Consumnes River Basin, located approximately halfway between Sacramento and Stockton, California. The project will provide additional benefits such as increased fish and wildlife resources resulting from stable river flow conditions, enhanced water quality standards, increased water-associated recreation areas, new employment opportunities, and opportunities for hydroelectric power development following are adverse environmental effects of the project: (1) inundation of some existing fisheries and forest areas; (2) some detrimental effects on water quality because of local consumptive use and generation of additional wastes; (3) vegetation losses from reservoir site land inundation; (4) possible loss of historical and archeological sites; (5) inundation of some existing recreational facilities; and (6) creation of conditions which may in-crease vector populations, but appropriate vector control methods will be carried out. Numerous alternative plans were studied and subsequently rejected. Comments of interested federal, state, and local agencies are noted. (Blank-Florida) W72-08010

Group 8A—Structures

GREAT FALLS FLOOD CONTROL PROJECT, SUN RIVER, MONTANA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Omaha, Neb.

Available from the National Technical Information Service as PB-198 918-F, \$3.00 in paper copy, \$0.95 in microfiche. August 19, 1971.24 p, 1 map, 8

Descriptors: *Montana, *Flood protection, *Channel improvement, *Flood control, *Environmental effects, Levees, Retaining walls, Drainage, Furrows, Riprap, Riparian plants, Borrow pits, Oxbow lakes, River flow, Culverts, Aesthetics, Landscaping, Flood plains, Aquatic habitats, Federal project policy, Project planning. Identifiers: *Environmental impact statements, *Sun River (Mont). *Sun River (Mont.).

To provide flood protection for a part of Great Falls, Montana, a flood control project is proposed consisting of a system of levees, inter-ceptor ditches, channel changes, and floodwall facilities. The following environmental impacts are listed: (1) protection against a standard project flood, (2) improvement of local drainage by filling n low areas with construction spoil materi als, (3) destruction of plant and sedentary animal communities from borrow operations and levee buildup, (4) creation of two oxbow lakes from channelization and installation of channel locks, and (5) alteration of some island biotic and physical configurations. Culverts will be installed to provide for riverflows and water exchange. Primary adverse effects include direct losses of much riparian habitat and a man-made appearance resulting from the construction seeding and main-tenance of levees and riprapped channel slopes. Various alternative proposals were considered and rejected because of high costs and lack of public support. Public meetings were held on this project and a draft statement was furnished to interested federal, state, and local agencies. Comments received from these agencies are included. (Blank-Florida) W72-08013

LAS CRUCES LOCAL PROTECTION, LAS CRUCES, NEW MEXICO (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Albuquerque, N. Mex.

Available from the National Technical Information Service as PB-202 923-F, \$3.00 in paper copy, \$0.95 in microfiche. September 27, 1971. 54 p, 4

Descriptors: *Environmental effects, *Flood control, *Reservoirs, *New Mexico, *Dam construction, Floods, Flood protection, Ditches, Open channels, Flood flow, Urbanization, Agriculture, Quarries, Rock excavation, Arroyos, Dry beds, Intermittent streams.
Identifiers: *Environmental impact statements, *Las Cruces (N. M.).

A dry flood control dam with spillway structures, a diversion ditch, and an open channel is proposed for protecting Las Cruces, New Mexico and adjacent county agricultural lands. The primary impact of the project will be flood prevention in urban and agricultural developments. No signifi-cant effect will be exerted on wildlife resources. The primary adverse effect focuses on removal of 83,000 cubic yards of protection stone from an existing small quarry. A subsequent restoration project will minimize this environmental damage.

Dust will be a problem only during construction. Four other reservoir plans in addition to no development were considered as alternatives. No development was disregarded because any of the reservoir projects would only exert a minimal adverse environmental effect. The reservoir project selected offers the desired protection with the most favorable benefit-cost ratio. Comments of interested agencies are included. (Kohla-Florida) PARK RIVER CONDUIT, HARTFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps_of Engineers, Waltham, Mass. New En-

Available from the National Technical Informa-tion Service as PB-202 721-F, \$3.00 in paper copy, \$0.95 in microfiche. September 17, 1971. 18 p, 1

Descriptors: *Environmental effects, *Concrete-lined canals, *Running waters, *Connecticut, Structures, Drains, Canal construction, Concretes, Open channels, Floods, Erosion, Flood protection, River flow, Urbanization, Community development.

Identifiers: *Environmental impact statements,

*Park River (Conn.).

An expanded conduit system is proposed for the north and south branches of the Park River at Hartford, Connecticut. The project includes con-struction of reinforced concrete conduits, a juncstructure, a headwall, an auxiliary conduit, and a pumping station. Since the Park River is already partly enclosed by a conduit system, only minimum vestiges of a natural environment remain. No possibility exists for a reversal in urbanization and a restoration of a natural environ-ment. Consequently, no adverse impact is an-ticipated. Moreover, the proposed network could ticipated. Moreover, the proposed network could beneficially reduce erosion, eliminate certain hazards associated with open channels, and minimize the danger of floods. Alternatives studied were additional reservoir construction; modification of existing reservoirs; diversion of the South Branch, Park River; and establishment of encroachment lines. All alternatives were found to entail greater environmental disruption and destruction than the proposed plan. Comments of interested agencies are included. (Kohla-Florida)

WATER RESOURCES DEVELOPMENT IN IL-

Corps of Engineers, Chicago, Ill. North Central Div. For primary bibliographic entry see Field 04A. W72-08023

WATER WAVE TRANSMISSION THROUGH AND REFLECTION BY PERVIOUS COASTAL STRUCTURES,

Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08B. W72-08071

KAWAIHAE HARBOR FOR LIGHT-DRAFT VESSELS, HAWAII COUNTY, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT). Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.

Available from the National Technical Informa-tion Service as PB-202 288F, \$3.00 in paper copy, \$0.95 in microfiche. November 12, 1971. 43 p, 2 plate, 5 tab.

Descriptors: "Hawaii, "Harbors, "Environmental effects, "Reefs, "Coastal engineering, Marine biology, Boats, Coastal structures, Boating, Water pollution, Docks, Marinas, Breakwaters, Shore protection, Tourism, Recreation, Coral limestones, Excavation, Turbidity, Navigation, Marine animals, Fish populations.

Identifiers: "Environmental Impact Statements, "Kownibas Uscher (Hayneii)" Descriptors: *Hawaii, *Harbors, *Environmental *Kawaihae Harbor (Hawaii).

The proposed harbor would alter the thirty-three acre project site from a shallow reef area to a lightdraft vessel harbor complex with reveted land areas, channels, and berthing areas. There is an existing but inadequate harbor. The area is non-re-sidential and is used for recreational boating and swimming. Coral life within the site's thirty-three acres of reef would be destroyed in erecting protective harbor structures. Changes in the site's physical environment, including landscaping, should have a significant impact on the area's socio-economic environment, due to increased urist appeal. A short term decrease in fish population is expected. However, an in-migration is expected when construction turbidity ceases. Inpected when construction turbidity ceases. Increased harbor pollution is expected from increased boating and construction of comfort stations. A 'non project' alternative would allow wave-action damage to watercraft to continue and would leave demands for the new facility unanswered. Although other plans were feasible, the project was deemed the best alternative based on a balancing of economic and environmental factors. Public comment was favorable. Agencies generally accepted the plan, although there was some criticism from the Environmental Center of the University of Hawaii. (Ilkson-Florida) W72-08313

WATER RESOURCES DEVELOPMENT IN WISCONSIN.
Corps of Engineers, Chicago, Ill. North Central

January 1, 1971. 55 p, 3 map, 23 photo, 2 tab.

Descriptors: *Wisconsin, *Water resources development, *Navigation, *Flood control, Project post-evaluation, Beach erosion, River basin development, Multiple-purpose projects, Lake Michigan, Lake Superior, Mississippi River, Channel improvement, Breakwaters, Harbors, Inland waterways, Rivers and Harbors Act, Dams, Levees, Piers, Flood plains, Project purposes, Project benefits, Navigable waters.

Water resources development projects in Wisconsin on which all authorized work has been completed and projects which are complete except for authorized changes are discussed. Navigation projects include harbor facilities and five Lake Superior and nine Lake Michigan ports. Other projects provide navigation improvement along the St. Croix and Mississippi Rivers. Completed flood and beach erosion control projects are also discussed. Current projects which have been completed to the extent of beneficial use, and newly authorized projects on which planning and construction have been initiated are discussed. Navigation projects underway include work on the upper Mississippi and the St. Lawrence Seaway. Navigation, flood control, emergency repair and rescue, and flood plain information reporting pro-jects under continuing special authority are discussed. Studies underway relate to navigation, flood control, beach erosion control, comprehensive basin studies, and certain special studies. Survey investigations authorized but not started are also detailed. Several tables and maps are presented, including a location map of all completed, started, and authorized projects. (Grant-Florida) W72-08316

WATER RESOURCES DEVELOPMENT IN MINNESOTA.

Corps of Engineers, Chicago, Ill. North Central

January 1, 1971. 51 p, 3 map, 16 photo, 2 tab.

Descriptors: *Minnesota, *Water resources development, *Navigation, *Flood control, Project post-evaluation, Beach erosion, River basin development, Multiple-purpose projects, Lake Superior, Mississippi River, Channel improvements, Dams, Levees, Piers, Breakwaters, Harbors, Indeed, Programment of the Programment of land waterways, Rivers and Harbors Act, Diversion structures, Project purposes, Project benefits, Navigable waters.

Water resources development projects in Minnesota on which all authorized work has been completed and which are complete except for changes are detailed. Eighteen completed navigation projects and fourteen completed flood control projects are included in this category. Projects underway include those which have been completed to the extent of beneficial use and newly authorized projects on which planning and construction have been initiated. Two navigation and four flood control projects are discussed. Active authorized projects are those which are approved but awaiting federal funding: two navigation and three flood control projects are discussed. Projects under special continuing authority include three navigation projects and ten small flood control projects. Also included are clearing and navigation straightening projects, snagging and navigation straightening projects, snagging and clearing projects, emergency repair and rescue, and flood plain information reports. Studies underand riood plain information reports. Studies under-way include ten navigation projects, twenty-two flood control projects, four comprehensive basin studies, and one special study on water levels in the Great Lakes. Special investigations authorized but not yet started include three navigation studies and two flood control studies. The report contains several maps, tables, and photographs. A map of all completed, started, and authorized projects is included. (Grant-Florida)

WATER RESOURCES DEVELOPMENT IN MICHIGAN.

Corps of Engineers, Chicago, Ill. North Central

January 1, 1971. 80 p, 1 map, 42 photo, 2 tab.

Descriptors: *Michigan, *Water resources development, *Navigation, *Flood control, *Beach eroison, Shore protection, Project postevaluation, Project planning, River basin developevaluation, Project planning, River basin development, Multiple-purpose projects, Lake Michigan, Lake Huron, Lake Superior, Channel improvement, Dams, Levees, Breakwaters, Harbors, Inland waterways, Rivers and Harbors Act, Flood plains, Project purposes, Project benefits.

Current information on the water resources development program of the Corps of Engineers in Michigan is provided. Fifty-eight completed navigation projects and three completed flood control projects are included. Eleven navigation and five flood control projects underway are reviewed. Active authorized projects, those which are approved but not yet funded, include four navigation, two flood control, and one beach erosion control project. Inactive navigation projects are also described. Projects under special continuing authority include ten small navigation projects, five small flood control projects, three shore damage projects, and three snagging and clearing projects. Floodplain information and technical reports are listed. Studies underway include twenty navigation projects, seven flood control projects, two comprehensive basin studies, and two special studies. Survey investigations authorized but not yet started include seven navigation studies, two yet started include seven navigation studies, two flood control studies, and one beach erosion studies. Maps and tables covering the location of all completed, started, and authorized projects are included. (Grant-Florida) W72-08318

UNITED STATES PORTION OF RETAMAL IN-UNITED STATES FORTION OF RETAMAL IN-TERNATIONAL DIVERSION DAM AND UNITED STATES DIKE, LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT). International Boundary and Water Commission, El Paso, Tex.

November 1971. 29 p, 1 map.

Descriptors: *Diversion dams, *Rio Grande River, *Flood protection, *International Bound. and Water Comm., *Environmental effects, Flood routing, Flooding, Flood control, Dams, Damsites, Water resources development, Mexico, United States, Dikes, Levees, Wildlife habitats, Agriculture, Fish, Land use, Water control, Ex-

cavation, Diversion structures, River regulation, Dam construction, Flow control, Flow augmenta-

Identifiers: *Environmental Impact Statements.

The project involves joint construction by the United States and Mexico of a diversion dam and United States and Mexico of a diversion dam and construction by the United States of a dike from that dam to the present river levee system. The project will provide equal div. rsion of floodwaters by both countries and will limit river flows to a safe capacity. The human environment will be enhanced through flood reduction. Most adverse environmental effects will be temporary, terminating at the end of excavation and construction. Fish habitats and a small area of wildlife habitats will experience a temporary, minor disturbance. The habitats and a small area of wildlife habitats will experience a temporary, minor disturbance. The project will require modification of existing canals and irrigation structures, thus temporarily interfering with agriculture activities and disturbing bird and wildlife habitats. The project will permanently take 136 acres of irrigated land and 24 acres of brush land. Since this project was approved through international agreement, consideration of alternatives was limited to alternative damsites. The present site was considered the most economical. The immediate damage to farming and wildlife habitats is far outweighed by the long term increased benefits from flood protection provided by the project. Comments of interested vided by the project. Comments of interested agencies are included. (Brackins-Florida) W72-08327

SMALL-BOAT HARBOR, MISSISSIPPI RIVER AT PEPIN, WISCONSIN (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn.

Available from the National Technical Informa-tion Service as PB-203 763F, \$3.00 in paper copy, \$0.95 in microfiche. October 29, 1971. 31 p, 2 plate,

Descriptors: *Breakwaters, *Docks, *Wisconsin, *Mississippi River, Shore protection, Waves (Water), Aeration, Harbors, Rivers and Harbors Act, Excavation, Dredging, Marinas, Structures, Hydraulic structures, Inland waterways, Lake shores, Engineering structures, Culverts. Identifiers: "Environmental Impact Statements, Pepin (Wis).

The project calls for the construction of a sand-filled breakwater to provide the Pepin, Wisconsin small-boat harbor, located on the Mississippi River, with protection from damaging wave ac-tion. Construction of the existing artificial harbor was completed in 1965 and serves both commer-cial fishing vessels and local and transient recrea-tional craft. The substantial wave damage now experienced by the harbor will be reduced by the project. Construction of a culvert will also provide water circulation in the harbor. The project would result in increased recreational activity through an increase in berthing areas. Also, the harbor shoreline will be more completely protected from wave action. The excavation in the existing harbor area will cause temporary turbidity. The area, however, is not conducive to fish spawning and implementation of the proposal will have little lasting effect on this phenomenon of marine life. Al-ternatives to the proposed action would be to forego the improvement or construct partially sub-merged floating (mobile) breakwater, but neither would prevent further deterioration of the harbor. Comments of interested agencies are included. (Nielsen-Florida) W72-08328

MILL CREEK LAKE, MILL CREEK, SCIOTO RIVER BASIN, DELAWARE AND UNION COUNTIES, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 949F, \$3.00 in paper copy, \$0.95 in microfiche. October 7, 1971. 53 p, 2 map, 9

Descriptors: *Ohio, *Environmental effects, *Dam construction, *Multiple-purpose projects, Descriptors: "Ohio, "Environmental effects, "Dam construction, "Multiple-purpose projects, "Flood protection, Flood control, Project purposes, Recreation, Sediment control, Water resources development, Flood plains, Aesthetics, Fishing, Fish management, Aquatic habitats, Wildlife habitats, Water quality control, Impaired water quality, Reservoir construction, Freshwater, Impounded waters.

Identifiers: "Environmental Impact Statements, "Scioto River Basin (Ohio), "Mill Creek Lake (Ohio).

The Mill Creek Lake project will involve construc-tion of a dam and other facilities for flood control, recreation, fish and wildlife conservation, and water quality control. It is one of seven major water quality control. It is one of seven major reservoir projects for water resources development in the Scioto River Basin. The project site is generally rural with level to gently sloping terrain. Environmental effects of the project include: inundation of animal habitats, grazing and cropland, decreased possibilities of flooding, alteration of sediment flows in the stream, alteration of the pH content, oxygen content and temperature of the water, and temperary erosion. Adverse environcontent, oxygen content and temperature of the water, and temporary erosion. Adverse environmental impacts include: loss of cropland and wildlife habitats, loss of some fish resources, loss of certain aesthetic qualities of the stream, creation of fluctuating pools, forced relocation of families, and possible water quality impairment. Alternatives considered include: single-purpose developments or combinations of other developments, greater flood plain zoning, and flood insurance. Long term advantages outweigh short term effects. Comments by other agencies are included. (Grant-Florida) W72-08331 W72-08331

CRYSTAL DAM, RESERVOIR, AND POWER PLANT, CURECANTI UNIT, COLORADO RIVER STORAGE PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATE-

Bureau of Reclamation, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-202 071F, \$3.00 in paper copy, \$0.95 in microfiche. December 6, 1971. 47 p, 1

Descriptors: *Environmental effects, *Colorado, Descriptors: Environmental effects, Contrator, *Concrete dams, *Hydroelectric plants, *Dam construction, Hydroelectric power, Power head, Reservoirs, Damsites, Water quality control, Tur-bidity, Impoundments, Reservoir sites, Channel-ing, Reservoir releases, Flow rates, Flow augmentation, Water management (Applied), Project planning, Project purposes, Federal project pol-

Identifiers: *Environmental Impact Statements, *Gunnison River (Colo), *Crystal Reservoir

The project, involving construction of a dam and a The project, involving construction of a dam and a hydroelectric powerplant, is needed to maximize power generation capabilities and regulate the Gunnison River. The project is located near Montrose, Colorado, and it is part of the Colorado River Storage Project. Probable environmental impacts of the project include the following: (1) river regulation below the dam to reduce high flows, elimination of destructive icing conditions, and uniform and minimum flows to preserve fishery uniform and minimum flows to preserve fishery habitat; (2) maximized power production; (3) improved downstream water quality through entrapment of high sediment flows; and (4) channelization of the stream below the damsite. Unavoidable adverse environmental effects will include a loss of fish habitet due to invuded in site of the stream below the damsite. of fish habitat due to inundation, alteration of trout stream habitat due to channelizing, inundation of high quality river scenery, and increases in stream turbidity during construction. The contractor, however, will be required to pass all waste and drainage water through a turbidity control plant to

Field 08—ENGINEERING WORKS

Group 8A—Structures

remove suspended sediments before discharge. Various alternatives to the proposed project are summarized. Comments of interested organizaare included. (Blank-Florida)

TAYLORSVILLE LAKE, SALT RIVER, KEN-TUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Louisville, Kv.

Available from the National Technical Informa-tion Service as PB-202 789-F, \$3.00 in paper copy, \$0.95 in microfiche. July 16, 1971. 26 p.

Descriptors: *Environmental effects, *Dam construction, *Reservoir construction, *Flood control, Recreation, Flood plain zoning, Flow augmentation, Streamflow, Flow control, Flood protection, Flood damage, Flood forecasting, Nonstructural alternatives, Water resources development, Fish management, Wildlife habitats, *Ken-

Identifiers: *Environmental Impact Statements, *Salt River (Ky), *Taylorsville Lake (Ky).

Taylorsville Lake is a proposed multipurpose lake project consisting of a reservoir and damsite on Salt River, 60 miles above that stream's confluence with the Ohio River and about four miles above Taylorsville, Kentucky. The project would significantly reduce flood damage in the River's lower reaches. Water storage would provide for low flow augmentation as well as enhance the area's recreational potential. However, approximately 3,050 acres of agricultural and forest lands and eleven known sites of minor archeological interest would be inundated. Approximately 18 miles of stream bank habitat and fisheries would be lost. Alternatives considered include flood plain zoning, evacuation, improved flood forecasting, flood insurance, acquisition of flood prone lands, levees, channel improvement, three additional reservoir sites, and no development. Project selection was based on maximization of net benefits in relation to economic output. Comments of con-cerned agencies are included. (Kohla-Florida) W72-08338

VOLO COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, APPLICATION UNDER THE SMALL RECLAMATION PROJECTS ACT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.

Available from the National Technical Information Service as PB-202 184-F, \$3.00 in paper copy, \$0.95 in microfiche. August 30, 1971. 29 p, 1 plate, 1 map, 2 dwg.

Descriptors: *Environmental effects, *Dam construction, *Reservoir construction, *Groundwater resources, Groundwater availability, resources, development, Water level fluctuations, Water sources, Water supply, Flood control, Reservoirs, Fisheries, Surface waters, Irrigation water, Recreation, *California.

Identifiers: *Environmental Impact Statements, *Cache Creek (Calif), *Indian Valley Reservoir (Calif)

The proposed Indian Valley Project consists of a multipurpose dam and reservoir and recreation facilities located on the North Fork of Cache Terek, Lake County, California. The reservoir would provide supplemental water to 83,000 acres of irrigated land to stabilize a declining ground-water basin and provide flood protection, fishery enhancement, and outdoor recreational benefits. Conversely, 4,000 acres of grazing land would be inundated, three rare plant species would be partly endangered, and possible archeological sites would be lost. Alternatives considered include no project, smaller reservoir capacity, and a mul-tipurpose reservoir. The selected alternative provides the greatest degree of benefits. The views of interested agencies are set forth. (Kohla-Florida) W72-08339

LOST RIVER WATERSHED PROJECT, INDI-ANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

Watershed Planning Div.

Available from the National Technical Informa-tion Service as PB-202 976-F, \$3.00 in paper copy, \$0.95 in microfiche. September 1971. 77 p, 1 map,

Descriptors: *Indiana, *Land development, *Environmental effects, *Channel improvement, *Flood control, *Watersheds (Basins), Erosion control, Water management (Applied), Land development, Soil conservation, Sedimentation, Detention reservoirs, Habitat improvement, Will Watershed management, Fish management, Wil-dlife habitats, Wildlife conservation, Scour, Chan-nels, Stream erosion, Stream fisheries, Flood damage, Flood plain zoning. Identifiers: *Environmental Impact Statements, *Lost River Watershed (Ind).

The project involves a comprehensive land treatment program, consisting of 11 floodwater retarding structures (5 with multipurpose storage), 2 grade stabilization structures, and 44 miles of stream channel improvement. The project is located in the Lost River Watershed in Lawrence, Washington, Orange, Dubois, and Martin counties, Indiana. Damage to watershed lands as well as roads and bridges is generally associated with floods which occur two to three times per year. Favorable environmental impacts of the proposed project consist of a 40% reduction in annual erosion, improvement of wildlife habitat, enhan ment of watershed fishery values, and a 60% reduction in flood damage. Additionally, the project will decrease scour on 1,060 acres of flood plain, diminish sediment concentrations in stream flows, and create a major outdoor recreation industry. Destruction of woodland areas along chan-nel banks and in dam and reservoir areas will adversely affect some wildlife values. Structural impoundments will inundate parts of a stream fishery and intermittent feeder streams. Several alternatives were considered, including no action, conversion of the flood plain to a less flood prone use, relation of the flood plant to a less flood profile the flood plain zoning, and construction of several local flood protection projects. Comments of interested agencies are included. (Blank-Florida) W72-08340

8B. Hydraulics

ANNUAL REPORT, 1971. Institute for Water Resources (Army), Alexandria, For primary bibliographic entry see Field 09C.

FINAL ENVIRONMENTAL STATEMENT, SHOBE CANYON CHANNEL CLEARING (FINAL ENVIRONMENTAL IMPACT STATE-

Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 04A. W72-08008

NONUNIFORM FLOW FUNCTIONS CIRCULAR

Waterways Experiment Station, Vicksburg, Miss.

Available from NTIS, Springfield, Va. 22151 as AD-733 866, Price \$3.00 paper copy, \$0.95 microfiche. Miscellaneous Paper No 2-601, September 1963. 18 p, 2 ref.

Descriptors: *Non-uniform flow, *Conduits, *Mathematical models, *Computer programs, *Hydraulic engineering, Backwater, Slopes, Discharge (Water), Methodology.

Identifiers: Non-uniform flow function, Data ta-

Various nonuniform flow functions have been devised to simplify backwater and drawdown curve computations. The value of these methods is that the depth and velocity in uniform channels may be directly computed at selected sections without resort to the laborious step method. The intervening water-surface profile can also be com-puted rapidly by the use of nonuniform flow functions. The need for extending the range of existing functions was revealed when the Hydraulic Analysis Branch of the U.S. Army Engineer Waterways Experiment Station was preparing a new draft of the Engineer Manual on 'Hydraulic Design of Out-let Works'. The tabulated functions were computed on the 225 GE electronic computer of the Technical Services Division of the Waterways Experiment Station. In addition to the tabulated data, use of these nonuniform flow functions in outlet works diversion flow problems is illustrated in a sample computation. (Woodard-USGS) W72-08070

WATER WAVE TRANSMISSION THROUGH AND REFLECTION BY PERVIOUS COASTAL STRUCTURES, Waterways Experiment Station, Vicksburg, Miss.

A. M. Kamel.

A. M. Kamel.
Available from NTIS, Springfield, Va. 22151 as
AD-733 873, Price \$3.00 paper copy; \$0.95
microfiche. Research Report H-69-1, October
1969. 27 p, 5 fig, 20 plate, 5 tab, 16 ref.

Descriptors: *Breakwaters, *Coastal structures, *Porous media, *Permeability, *Model studies, Waves (Water), Steady flow, Infiltration, Hydraulic structures, Engineering structures, Refraction (Water waves), Equations, Forecasting. Identifiers: Research project.

An expression is given for the resistance of free surface flow in a porous medium (such as a coastal rubble-mound breakwater) in terms of the density of the fluid, the approach velocity, the grain diameter of the material in the breakwater structure, and a resistance coefficient which is a function of Reynolds number of the flow. The length of the structure relative to the grain diameter is an important factor in determining the resistance of free surface flow in a porous medium. A certain ratio between the length of the structure and its grain diameter must be reached before the structure can be treated as a porous medium. An ex-pression for damping of translation waves by screen filters was modified to give the transmission coefficient of surface waves propagated through a porous structure. The constants in this expression were also found to be a function of the length of the structure relative to the grain diame-ter. Measured and computed values of wave trans-mission coefficients agreed. (Woodard-USGS)

MOMENTUM JETS LAMINAR IN STRATIFIED FLUID, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources. For primary bibliographic entry see Field 05B. W72-08135

MIXING OF DENSITY-STRATIFIED IMPOUND-MENTS WITH BUOYANT JETS, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.

For primary bibliographic entry see Field 05B. W72-08136 CHARACTERISTICS OF TRANSVERSE MIX-

ING IN OPEN-CHANNEL FLOWS,
California Inst. of Tech., Pasadena. W. M. Keck
Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 05B.
W72-08139

FREE-VORTEX THEORY APPLIED TO FREE OVERFALLS, Liverpool Univ. (England). Dept. of Civil En-

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gineering.
K.H. M. Ali, and A. Sykes.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY5, p
973-979, May 1972. 5 fig, 1 tab, 10 ref.

Descriptors: *Overflow, *Overfalls, *Discharge (Water), *Vortices, *Open channel flow, Discharge measurement, Weirs, Flow separation, Stage-discharge relations.
Identifiers: *Free-vortex theory, *Free overfalls.

When the flow from an open channel is discharged freely into the air, the depth at the brink can be often closely correlated with the flow rate. A 40-ft often closely correlated with the flow rate. A 40-ft by 1-ft horizontal open rectangular channel was used to study the end-depth ratio for shooting flow. The variation in Froude number was obtained by changing the discharge and the opening of an upstream sluicegate. Brink flow can be successfully imitated by a mathematical model embodying velocity distribution and streamline curvature appropriate to a free vortex. The agreement with experiments is very close, over a wide range with experiments is very close, over a wide range of channel geometries. (Knapp-USGS) W72-08193

REATTACHING FLOW DOWNSTREAM OF LEAF GATE, University of Manchester Inst. of Science and Technology (England). R. Narayanan, and A. J. Reynolds. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY5, Paper 8919, p 913-934, May 1972. 16 fig, 2 tab, 22 ref, ap-nend.

Descriptors: *Flow separation, *Vortices, *Gates, *Open channel flow, *Flow control, Waves (Water), Flow characteristics, Turbulence, Fourier analysis, Water circulation, Hydraulic jump. Identifiers: *Gates (Leaf).

Mean velocities and wall pressures were measured Mean velocities and wall pressures were measured downstream of a blockage simulating a partially closed leaf gate. Six plates were used; the ratios of the heights of the plates to the depth of the duct are in the range 0.161 to 0.833. The Reynolds number based on the height of the plate is typically about 100,000. The pressure fluctuations are related to the velocity fluctuations. Maximum intensities of pressure and velocity fluctuations coincide in a shear layer extending agailed to the duct sites of pressure and veneral fluctuations concide in a shear layer extending parallel to the duct wall. Peak rms value of pressure fluctuations occurs at a point 0.6 to 0.8 times the distance of reattachment. (Knapp-USGS)

DRAG COEFFICIENT OF CYLINDERS IN TUR-

DRAG COEFFICIENT OF CYLINDERS IN TUR-BULENT FLOW, Arizona Univ., Tucson. Dept. of Systems and In-dustrial Engineering. S. C. Ko, and W. H. Graf. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY5, Paper 8920, p 897-912, May 1972. 10 fig, 1 tab, 20 ref, ap-

Descriptors: *Turbulent flow, *Turbulence, "Drag, "Flow resistance, Hydraulics, Fluid mechanics, Flow characteristics, Hydraulic models, Hydrodynamics. Identifiers: "Wind tunnels.

The effects of free-stream turbulence on the drag The effects of free-stream turbulence on the drag coefficient of a circular cylinder were investigated experimentally in an air duct. The experiments were performed over a range of Reynolds numbers, based on mean velocity and cylinder diameter, from 1,350 to 8,000. The turbulence intensity was between 1.2% and 21%. The range of the dimensionless turbulence scale was from 0.5 to 3.3. Two smooth circular cylinders were used. They were 1/4 in. and 1/2 in. 6.35 mm and 12.7 mm shell fraction. Equations describing the relationships between the drag coefficient and turbulence characteristics were also obtained. (Knapp-USGS) W72-08196

FLOW PROCESSES IN OPEN CHANNEL

State Univ. of New York, Buffalo. Dept. of Civil Engineering. R. P. Apmann.

K. P. Apmann.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY5, Paper 8886, p 795-810, May 1972. 6 fig, 1 tab, 21 ref, append.

Descriptors: *Open channel flow, *Meanders, *Channel morphology, *Tractive forces, Shear drag, Hydraulics, Scour, Turbulent flow, Roughness (Hydraulic), Laboratory tests, Hydraulic models, Alluvial channels.

Identifiers: Open channel bends.

Available theoretical solutions for flow patterns in bends yield valid distributions of the longitudinal or forward velocity component. This is primarily due to the complexity of the natural geometry of bends and of the basic flow equations. In place of complete analytic solutions, various approximation methods for predicting boundary shear stress and other flow qualities are used. Experimentation is valuable in searching for generalized solutions to these problems. Some field observations made at Buffalo Creek, N. Y. of maximum shear stresses, depths in bends, and related characteristics. stresses, depths in bends, and related charac-teristics were correlated with applicable laborato-ry and analytic studies. The energy gradient over the reach was 0.0010, average cross-sectional velocities ranged between 3.8 fps and 7.7 fps, and cross-sectional areas between 700 sq ft and 1,600 sq ft. The general agreement of the field data with the laboratory tests suggests that alluvial channel bends tend to deform into a shape which offe minimum resistance to the flow. (Knapp-USGS) W72-08202

A STUDY OF THE TURBULENCE CHARAC-TERISTICS OF DIVERGING SHEAR FLOW.

California Univ., Davis. Dept. of Water Science and Engineering.
A. F. Babb, and J. Amorocho.

Water Science and Engineering Paper No 1048, December 1971. 193 p, 67 fig, 4 plate, 8 tab, 49 ref. 4 append. OWRR B-037-CAL (11).

Descriptors: "Turbulent flow, "Flow characteristics, "Turbulent boundary layers, "Mathematical studies, "Pipe flow, Analytical techniques, Model studies, Equations, Reynolds number, Energy equation, Laboratory equipment, Pressure, Velocity, Shear stress, Kinetics, Diffusion, Anemometers, Flow measurement, Hydrologic

Detailed information was acquired on the mean measures and turbulence characteristics of gradually diverging, boundary-attached shear flow. The configuration selected was a low-angle conical diffuser connecting two long straight lengths of circular pipe. Air was used as the test fluid, and turbulence quantities were measured with a hot-film anemometer. The analysis involved evaluation of the various terms of the differential and integral forms of the mean energy equation, of the integral forms of the secondary energy and momentum equations, and computation of energy and momentum balances. A detailed description of the field of flow of mean energy throughout the system and a partial description of the flow of turbulence energy are given. Flow characteristics were observed within the diffuser and the downstream pipe. Hot-film anemometry procedures were developed and verified for measurement of the terms in the turbulent flow equations. A new empirical relationship was derived for use with yawed film sensors, which differs from that customarily used with hot-wire sensors. (Woodard-USGS) W72-08220

HYDRAULIC MODEL STUDIES OF IN-TERSTAGE MODULE PIPING IN THE 2.5 MGD UNIVERSAL DESALINATION PLANT, Bureau of Reclamation, Denver, Colo. Div. of For primary bibliographic entry see Field 03A.

8C. Hydraulic Machinery

INFLUENCE OF DRAFT TUBE DIMENSIONS ON KAPLAN TURBINE EFFICIENCIES, Kristinehamn Works (Sweden).

R. Alestig.
Paper, International Association for Hydraulic Research Symposium, Stockholm, Transactions, Part I, 1970. 12 p, 11 fig.

Descriptors: *Kaplan turbines, *Draft tubes, Test procedures, Economics, Model studies, Hydroelectric powerplants, Project planning, Construction costs, Hydraulic machinery. Identifiers: *Experimental models, *Turbine efficiency, Sweden, Test results, Experimental data, Geometric shapes.

For a powerplant equipped with vertical Kaplan turbines with a given runner diameter, the construction cost and performance are influenced most by the spiral casing and draft tube dimensions. Model tests using a systematic variation of draft tube dimensions were conducted to determine the influence of draft tube dimensions on the efficiencies of Kaples turbines. Tests show: (1) and (1) and (1) are the shows (1) and (1) are the shows (1) and (1) are the shows efficiencies of Kaplan turbines. Tests show: (1) an optimum draft tube depth exists; (2) for best per-formance, the horizontal extension must be of sufficient length; (3) extremely deep draft tubes are of no advantage in providing turbine efficiency; and (4) the influence of draft tube dimensions on turbine efficiency is not affected by runner type. These results provide information useful to engineers in making economic studies. (USBR)

INCREASING POWER PRODUCTION BY IMPROVED TRASHRACK DESIGN,

Washington State Univ., Pullman. J. F. Orsborn.

Paper, International Association for Hydraulic Research Symposium, Stockholm, Sweden, Transactions, Part I, 13 p, 7 fig, 5 tab, 12 ref, 1970.

Descriptors: *Trashracks, *Losses, *Energy losses, *Structural shapes, *Hydraulic design, Hydraulic turbines, Hydraulic structures, Hydroelectric powerplants, Structural design, Model studies, Fluid dynamics, Coefficients. Identifiers: Streamlining.

Loss of energy caused by trashracks at the entrances to hydroelectric turbine installations is considered negligible compared to total available energy. Trashrack designs, therefore, have been based primarily on structural criteria, giving little consideration to the proper evaluation of hydraulic criteria. Losses have been estimated by empirical equations which consider only losses caused by the bars. This method neglects, or only partially considers, losses caused by large structural members. Proper evaluation of the total trashrack losses is equally important for large turbines and bers. Proper evaluation of the total trashrack losses is equally important for large turbines and for low-head turbines. Elements influencing trashrack loss are considered and a historical sum mary of loss equations provided. A loss estimate is compared with actual field measurements for a prototype trashrack. The redesign of this trashrack is described, and the estimated saving in energy acking the redesign is given. The achieved by redesign is given. The material presented is applicable to all types of trashrack installations. (USBR) W72-07921

DESIGN AND TESTING OF THE NICKAJACK MULTI-LEAF GATE SYSTEM, Stone and Webester Engineering Corp., Boston, Mass.; and Tennessee Valley Authority, Norris. G. E. Hecker, and R. A. Elder.

Field 08—ENGINEERING WORKS

Group 8C-Hydraulic Machinery

Paper, International Association for Hydraulic Research Symposium, Stockholm, Sweden, Transactions, Part I, 1970. 12 p, 9 fig, 2 ref.

Descriptors: *Bulkhead gates, *Model studies, *Prototype tests, *Intake gates, Hydraulic gates, Instrumentation, Friction, Vibration, Discharge (Water), Gates.

Identifiers: *Emergency closures, Tennessee Valley Authority, Leaf gates, Gate leaves, Nickajack Dam (Tenn), Lifting devices, External forces, Oscillations, Test results.

The Nickajack multileaf gate system was designed to effect an emergency closure of turbine intakes at flows up to runaway discharge. A beam suspended by wire cable from a crane is used to position each of 1 have Recourse the life; here. each of 3 bays. Because the lifting beam and lower gates are completely immersed in the flow, force oscillations may occur and flow interaction between the beam and gate may induce premature release of the gate or prevent beam removal from a positioned lower gate. Particular attention was given to frictional forces to prevent the gates or beam from stopping prior to seating. Model tests were used to develop the beam and gate design; prototype tests were conducted to verify gate system effectiveness and to check model testing techniques. During prototype tests a complete the techniques. During prototype tests a complete tur-bine closure was made for an initial flow of 10,000 cfs. No vibrational problems were encountered, and model prototype test results showed good agreement. Test results are discussed. (USBR) W72-07926

PREDICTING CAVITATION IN VALVES,

PREDICTING CAVITATION IN VALVES, Colorado State Univ., Fort Collins. J. P. Tullis, R. A. Hogan, and N. C. Whittington. Paper, International Association for Hydraulic Research Symposium, Stockholm, Sweden, Transactions, Part I, 1970. 10 p, 11 fig, 2 ref.

Descriptors: *Cavitation, *Valves, *Performance, Hydraulic machinery, Mechanical equipment, Design criteria, Laboratory tests, Erosion,

Forecasting. Identifiers: Valve vibration, Cavitation index, Scale effects.

Information for improving design accuracy of valve systems to permit cavitation-free operation is presented. Critical cavitation conditions based on intensity are defined. To simplify application of cavitation data, a new parameter is introduced. Scale effects and data used to predict effects of size and pressure variations on the critical index for valves are discussed. Laboratory studies are recommended to evaluate the critical index. Information on scale effects can then be applied to adjust data to prototype conditions. If laboratory studies are not possible, suggested alternate design methods are given. (USBR)

COMMENTS ON CAUSES OF AND REMEDIES FOR STRUCTURAL VIBRATIONS IN HYDROELECTRIC PLANTS,

Aktiebolaget Nohab, Trollhattan (Sweden). G. B. Benko, and E. K. Holmen. Paper, International Association for Hydraulic Research Symposium, Stockholm, Śweden, Transactions, Part I, 1970. 16 p, 6 fig, 1 tab, 11 ref.

Descriptors: *Hydraulic turbines, *Vibration, *Resonance, *Hydroelectric powerplants, Discharge (Water), Frequency, Hydraulic machinery, Structural members, Sounds, Investigations. Identifiers: Sweden, Vibration exciters, Frequency characteristics, Intensity, Resonators, Har-

Results of investigations into the causes of disturbing resonance-like vibrations in dominating structural parts of powerplants are discussed. Resonance mechanisms found and measures taken to eliminate or limit vibrations, to acceptable levels, are given. In the cases presented, one com-

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mon feature was evident: Although the disturbances were hydraulically excited, no seri-ous consequences would have occurred without the interaction of some mechanical resonator during periods of high discharge through the turbine. A more generalized survey of possible excitation sources and resonators revealed that lighter structures of larger size (made possible by the availability of high-tensile materials) increase the probability of undesirable resonances. (USBR)

LOWER GRANITE LOCK AND DAM, SNAKE RIVER, WASHINGTON AND IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 08A. W72-08004

WASTE OIL RECOVERY UNIT, For primary bibliographic entry see Field 05G. W72-08275

DOWNSTREAM AERATED GATE SLUICE, Escher Wyss G.m.b.H., Zurich (Switzerland). (As-G. Dolder

U. S. Patent No. 3,518,832, 2 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office Vol 876, No 1, p 55, July 7, 1970.

Descriptors: *Patents, *Sluice gates, Sluices, *Hydraulic gates, Irrigation channels, Storage, Lakes, Water levels, Water management (Ap-plied), Discharge, Water discharge, Reservoir

A gate sluice to regulate the quantity of discharge of water in a channel has a sluice gate movable in recesses in the side walls of the channel. The flowseparation edge at the foot of the sluice gate lies in the same plane as the edges between the side walls of the upstream part of the channel. The upstream-directed surface of the sluice gate is situated up-stream of this plane. (Sinha-OEIS) W72-08297

CRYSTAL DAM, RESERVOIR, AND POWER PLANT, CURECANTI UNIT, COLORADO RIVER STORAGE PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATE-

Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A.

ARCHER-WELD 230-KV TRANSMISSION LINE AND WELD SUBSTATION, COLORADO RIVER STORAGE PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Denver, Colo.

Available from the National Technical Informa-tion Service as PB-203 875F, \$3.00 in paper copy, \$0.95 in microfiche. November 2, 1971. 44 p, 1

Descriptors: *Extra high voltage, *Federal Power Act, *Transmission (Electrical), *Electrical networks, *Environmental effects, Electric power, Extra long distance, Electric power demand, Electric power industry, Substations (Electrical), Electrical stability, Electric power failure, *Colorado, *Wyoming.
Identifiers: *Environmental Impact Statements,

*Greeley (Colo), *Cheyenne (Wyo).

Installation of 57 miles of 230-KV transmission line is proposed between the Archer Substation near Cheyenne, Wyoming, and the Weld Substa-tion near Greeley, Colorado. Construction of the Weld Substation is an integral part of the project. The project will provide northern Colorado with electric power which meets industry standards of

reliability. Normal as well as emergency demands will be met, thus rendering the area less vulnerable to power interruptions and concomitant economic loss. Construction will cause some disturbance to loss. Construction will cause some disturbance to the landscape; however, the impact on wildlife will be insignificant. Much of the new line will follow existing powerlines. While the remainder of the line will alter the landscape, it will eliminate the need for constructing additional generating facili-ties. Alternatives considered include no-action, construction of a private generating plant, other line routes, and other tower designs. The selected project best meets public needs at the lowest cost and minimum environmental effect. Comments of interested entities are included. (Kohla-Florida)

NIBLACK LEVEE (PUMPING PLANTS), WABASH RIVER, INDIANA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky.

Available from the National Technical Informa-tion Service as PB-202 655-F, \$3.00 in paper copy, \$0.95 in microfiche. October 1971. 17 p, 1 map, 6

Descriptors: *Indiana, *Flood control, *Pumping plants, *Levees, *Environmental effects, River basin development, Drawdown, Land subsidence, Quality control, Agricultural watersheds, Land Quanty Control, Agricultural watersneas, Land management, Land reclamation, Standing waters, Pondage, Water spreading, Flood protection, Flood plains, Flood irrigation, Floodwater. Identifiers: *Environmental Impact Statements, *Wabash River (Ind), *Niblack Levee (Ind).

The project consists of pumping facilities for the removal of ponded water from the projected area of Niblack Levee, located in Knox and Sullivan Counties, Indiana. The project would reduce agricultural crop losses from flooding behind the levee, enhance aesthetics and the environmental setting of the area by reducing and stabilizing the ponding area, increase available agricultural land, and reduce inundation damage to wildlife habitat. Some adverse environmental effects in the form of noise pollution and aesthetic damage will result from the presence of pumping plants and power lines. Some changes in pond ecology will be brought about by reduced ponding and increased agricultural use of the area. The only alternative to the proposed action would be not to install pumping plants. Since present flood water ponding is damaging to both agriculture and wildlife, the alreceived from interested federal, state, and local agencies are included. (Blank-Florida) W72-08336

WHITNEY LAKE, BRAZOS RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Army Engineer District, Fort Worth, Tex For primary bibliographic entry see Field 04A. W72-08342

8D. Soil Mechanics

SEEPAGE THROUGH DAMS. Politekhnicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 08A. W72-07913

ENGINEERING AND DESIGN; EARTH AND ROCK-FILL DAMS, Waterways Experiment Station, Vicksburg, Miss. J. R. Compton, and S. J. Johnson. EM 1110-2-2300, March 1, 1971.

Descriptors: *Earth dams, *Dam design, *Dam construction, *Rockfill dams, Seepage control, Spillways, Outlet works, On-site investigations, Purpose of manual is to present fundamental principles underlying the design and construction of earth and rock-fill dams, excluding hydraulic means. The general principles are also applicable to the design and construction of earth levees. The following are discussed: general design considerations; field investigations and laboratory testings; foundations and abutments; embankment (which includes embankment materials, seepage control, compaction requirements, and slope protection); appurtenant structures (as outlet works and spillway); construction; and instrumentation. Three pages of references are given.

LIQUEFACTION OF SATURATED GRANULAR

Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). M. Kurzeme.

Proceedings, 1st Australia-New Zealand Conference on Geomechanics, Vol. 1, Melbourne, Australia, p 45-53, 2 tab, 30 ref, Aug 1971.

Descriptors: *Liquefaction, *Soil mechanics, *Saturated soils, Sands, Triaxial tests, Void ratio, Bibliographies, Silts, Vibration, Laboratory tests, Vibration tests, Cohesionless soils, Earthquakes, On-site tests.

dentifiers: *Saturated sands, *Soil liquefaction,

Identifiers: *Saturated sands, *Soil liquefaction, Simple shear tests, Bulk sampling, Granular materials, Confining pressures, Loose soils.

Liquefaction involves the partial or total loss of strength and stability of saturated granular soils under dynamic loading. During the 1960's, areas in Japan, Chile, and Alaska suffered considerable damage from liquefaction. Early research pursued the concept of critical acceleration to reduce effective stresses in soil to zero. Later efforts used triaxial and simple shear tests to simulate, in a machine, the stresses assumed to occur during a seismic loading. From these and other research efforts, the liquefaction resistance of a soil, expressed as the number of cycles of loading necessary to cause liquefaction, is dependent upon initial relative density, initial effective confining pressure, the magnitude of cyclic shear stress, and the strain history of the soil. No functional interrelationships among these parameters are available. Field liquefaction can be predicted, but with unconfirmed accuracy. Monitored field tests are needed in areas of high seismicity. Techniques should be developed for determining liquefaction potential of in situ soils. (USBR)

FINITE ELEMENT ANALYSES OF RETAINING WALL BEHAVIOR,

Duke Univ., Durham, N. C.; and California Univ., Berkeley.

G. W. Clough, and J. M. Duncan.

Journal of the Soil Mechanics and Foundations
Division. America Society of Civil Engineers, Vol.

Journal of the Soil Mechanics and Foundations Division, America Society of Civil Engineers, Vol. 97, No. SM12, p 1657-1673, 9 fig, 2 tab, 27 ref, 2 append, Dec 1971.

Descriptors: *Finite element analysis, *Retaining walls, *Interfaces, *Backfill, *Simulation, Soil mechanics, Soil structure, Earth pressure, Sands, Shear strength, Shear stress, Pressure, Structural behavior, Laboratory tests, Bibliographies, Displacements

placements. *Soil-structure interaction, Wall friction, Shear tests, Bulk modulus, Passive pressure, Direct shear.

A new procedure simulates realistic behavior of the interface between a backfill soil and a retaining wall in finite element analyses. Laboratory tests showed interface behavior is dependent upon normal and shear stresses on the interface. An analytical formulation, derived to fit the observed relationships, is used to govern the behavior of a one-dimensional element serving as the interface between 2-dimensional soil and retaining wall elements in finite element analyses. A typical retaining wall-backfill system with varying modes of

wall behavior and degrees of wall roughness is analyzed. Earth pressure distributions before reaching the ultimate conditions are nonlinear. Ultimate conditions and general behavior of the system agree with classical theory and previously observed behavior. An additional analysis simulating the exact construction sequence of a retaining-wall backfill system is presented. (USBR)

TUNNEL ADVANCE RATE PREDICTION BASED ON GEOLOGIC AND ENGINEERING OBSERVATIONS,

OBSERVATIONS, Arizona Univ., Tucson. D. W. Gentry, F. S. Kendorski, and J. F. Abel, Jr. International Journal of Rock Mechanics and Mining Science, Vol. 8, No. 5, p 451-475, 20 fig, 11 tab, 2 ref, append, September 1971.

Descriptors: *Tunnels, *Tunneling, *Tunnel construction, *Mathematical models, Regression analysis, Geology, Equations, Statistical analysis, Planning, Boreholes, Graphical analysis, Tunnel design, Mathematical studies, Statistical models, Colorado.

Identifiers: Straight Creek Tunnel (Colo), Variables, *Mathematical analysis.

Engineering and geologic data from a pilot bore in Straight Creek Tunnel were mathematically analyzed to develop a method of predicting boring rate. Fifty sets of data were taken at 25-ft intervals from 1250 ft of the 8800-ft-long tunnel. The engineering data consisted of variables such as tunnel size, rock temperature, percent of lagging, and the day of the week. Geological variables included joint spacing, percent of feldspar, fault thickness, foliation angle, and strike angle. In addition to actual value, the cube root, square root, cube and square of each variable were calculated for all 50 locations. Correlation between the 5 possible values related to each variable and the tunnel advance rate was determined. Those terms correlating best with advance rate were used in a step-wise regression program to produce equations relating advance rate to functions of the variables. The geologic variables equation, having a standard deviation of 0.33 ft/shift during an actual average advance rate of 10.36 ft/shift, produced better results than the engineering variables equation. Advance rate predictions at 12 locations in the remaining portion of the tunnel had a standard deviation of 2.13 ft/shift and a percent error of from 6 to 99. (USBR)

CLASSIFICATION OF COARSE SOILS BASED ON ENGINEERING PROPERTIES,

Nagoya Univ. (Japan). K. Ueshita, and K. Nonogaki. Soils Foundations, Vol. 11, No. 3, 91-111, Sept 1971. 20 fig, 16 ref.

Descriptors: *Soil classification, *Soil mechanics, *Soil investigations, *Soil physical properties, Sands, Gravels, Soils, Permeability, Soil properties, Soil types, Bibliographies. Identifiers: Japan, Dry density, California bearing ratio, Permeability coefficients.

In a study to establish a Japanese Unified Soil Classification System (Japanese USCS), several changes in the existing Unified Soil Classification System (USCS) were proposed. The changes are: (1) The boundary between gravel and sand is 2.0 mm; (2) boundaries between clean gravels or sands, gravels or sands with some fines, and fine soils are 5%, 15%, and 50% fines, respectively; and (3) criteria for well-graded gravels or sands are a coefficient of uniformity, C sub u, greater than 10 and a coefficient of curvature, C sub z, between 1 and square root of C sub u. Criteria based on the soil liquid limit and plasticity index are given for classifying fines as desirable, undesirable, or clayey. The changes and additions, aimed at bringing the Japanese USCs into better agreement with engineering properties of soils, resulted from

laboratory tests to determine the maximum dry density, coefficient of permeability, and the California Bearing Ratio. (USBR) W72-07929

LAPWAI CREEK, CULDESAC, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.

Available from the National Technical Information Service as PB-200 224-F, \$3.00 paper copy, \$0.95 in microfiche. June 1971. 17 p, 1 dwg.

Descriptors: *Environmental effects, *Levees, *Flood control, *Flood protection, Earthworks, Retaining walls, Project planning, Streams, Floods, Flood plain zoning, Rock excavation, Check structures, Stream improvement, *Idaho, Vegetation, Quarries, Rocks, Channel improvement.

Identifiers: *Environmental impact statements, *Culdesac (Idaho).

The project would consist of stream channel renovation with an earth and rock levee extending 3,200 feet on the left bank of the creek in the village of Culdesac, Idaho. Flood protection for the village will be provided by the levee. The project will change the visual aspect of the creek by replacing the rough, naturalistic streambed with a more uniform bottom and rock-lined streambed. A rock quarry would be created which would require alteration of a parcel of commercial property now covered with native grasses, thus creating a land-scape scar. Fish and wildlife resources will not be significantly affected because the existing habitat is limited. Adverse environmental effects include: removal of a small amount of riparian vegetation, creation of a rock quarry, and a temporary disruption during construction. Alternatives to the project are: no development, flood plain zoning, and an upstream dam. The project will provide necessary long term flood protection for the village. Comments of other agencies are included. (Horwitz-Florida) W72-08007

PORT JEFFERSON HARBOR, NEW YORK NAVIGATION PROJECT (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, New York. For primary bibliographic entry see Field 04A. W72-0801.

ATLANTIC HARBOR OF REFUGE, CARTERET COUNTY, NORTH CAROLINA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Army Engineer District, Wilmington, N. C.

Available from the National Technical Information Service as PB-198 870-F, \$3.00 in paper copy, \$0.95 in microfiche. June 23, 1971. 38 p, 12 tab.

Descriptors: *Environmental effects, *Coastal structures, *Coastal engineering, *Harbors, *Shore protection, *North Carolina, Coasts, Breakwaters, Hurricanes, Ships, Storms, Inland waterways, Navigation, Engineering, Marshes, Coastal marshes, Excavation, Turbidity. Identifiers: *Environmental impact statements, *Carteret County (N.C.).

The construction of a navigational project consisting of a connecting channel, a basin, and a breakwater is involved. Its purpose is the creation of a harbor to protect vessels from windstorm damage. The benefit-cost ratio is 1.3. The project will result in the loss of juncus marsh and 3.7 acres of existing sound bottom. The proposed site is the least valuable for fishing and wildlife purposes within the surrounding area. During dredging operations there will be increased water turbidity. The effect of the project on fish and wildlife will be minimal. Alternatives involving another basin site, different spoil placement, and no development were con-

Field 08-ENGINEERING WORKS

Group 8D-Soil Mechanics

sidered and rejected. A 'no project' alternative would leave the area without a safe harbor during storms. The project is expected to provide long term benefits and will have a minimal effect on water quality. The marsh area would be irreversibly altered. Other agencies reacted favorably or had no comment. There were no objections from citizen groups. (Ilkson-Florida) W72-08015

SHORT BAYOU DRAINAGE DISTRICT PRO-JECT MEASURE, SOUTHEAST DELTA RC AND D PROJECT, MISSISSIPPI (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04A.

CRACKING OF EARTH AND ROCKFILL

DAMS, Harvard Univ., Cambridge, Mass.

S. W. Covarrubias.

Army Engineer Waterways Experiment Station Contract Report No. S-71-11, Vicksburg, Miss.,

Descriptors: *Earth dams, *Rockfill dams, *Cracks, *Dam failure, Finite element analysis, Soil strength. Identifiers: *Dam crests, Earth dam performance.

Purpose of the investigation is to compare the longitudinal strains observed along the crests of Sum mersville and Mattmark Dams with the results of analyses using the finite element method. All materials were assumed to be linearly elastic, with equal properties in tension and compression. The only load considered was the weight of the embankment. The results of the analyses show good agreement between the measured and the com-puted strains. Similar results were also obtained in previous investigations by the author. It is con-cluded that this method of analysis is a meaningful tool in designing earth and rockfill dams. W72-08159

CLINTON LAKE, WAKARUSA RIVER, KAN-SAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Kansas City, Mo.

Available from the National Technical Informa-tion Service as PB-203 761F, \$3.00 in paper copy, \$0.95 in microfiche. October 29, 1971. 37 p, 1 map,

Descriptors: *Earth dams, *Reservoirs, *Water resources development, *Environmental effects, Flood control, Water supply, Recreation, Dams, Water storage, Flow control, Impoundments, Dam construction, Community development, Area redevelopment, Water demand, Flood protection, Project purposes, Multiple-purpose projects, River regulation, Lakes, Agriculture, Water quality, Wildlife habitats, Urbanization, *Kansas. Identifiers: *Clinton Lake, *Wakarusa River (Kan), *Environmental Impact Statements.

The project consists of construction of an earthfill dam and lake which will provide flood control, a water supply reservoir, a fish and wildlife habitat, and a recreation area. The lake will inundate 50 miles of river and tributary streams destroying the stream habitats. The lake will also inundate 7,000 acres of agricultural, timber and brush land. Because of its proximity to Lawrence, Kansas, the lake can be expected to encourage residential and commercial development of the area. This expected development will further reduce wildlife habitats and population in the area. Without proper management and control of sanitary wastes from these developments water quality problems from these developments water quality problems could develop. There appears to be no practical al-ternative, other than abandonment of the project, which can be done without similar adverse environmental effects. But the project will provide

much needed flood protection, water supply, and recreational potential for urban development of the area. Comments of interested state and federal agencies are included. (Brackins-Florida) W72-08329

NEW LONDON HURRICANE PROTECTION PROJECT, NEW LONDON, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATE-

Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-201 310F, \$3.00 in paper copy, \$0.95 in microfiche. July 26, 1971. 18 p, 1 map, 4 append.

Descriptors: *Environmental effects, *Flood control, *Hurricanes, *Sea walls, Floods, Floodproofing, Barriers, Retaining walls, Tidal effects, Landfills, Flood protection, Construction, *Connecticut, Navigation, Flood damage, Breakwaters. Identifiers: *New London (Conn), *Environmental Impact Statements.

The project, involving construction of a 5,900 foot system of earth filled rock protected barriers with navigation openings, is designed to protect certain areas of New London, Connecticut against hurricane tidal flooding. The specific area to be protected is comprised of commercial-industrial facilities interspersed with residential areas. The project would prevent flooding that has resulted in abandonment, neglect, and deterioration. The environmental impact of the project is favorable, replacing a badly blighted area facing a valuable waterfront with an imaginative use of the property for manufacturing, open space, parks, walkways, and eventually shore-fishing opportunities. Minor adverse effect on marine life during construction of the barrier would result. Views would be restricted on both sides of the barrier. Alternatives include placing a barrier at the mouth of the Thames River, flood proofing, and taking no-ac-tion. All of these are economically, socially, and politically unfeasible. The project would permit use of formerly developed flood-prone areas for new development and community improvements. Comments of concerned agencies are set forth. (Nielsen-Florida) W72-08330

TIOGA-HAMMOND LAKES PROJECT, TIOGA COUNTY, PENNSYLVANIA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md.

Available from the National Technical Informa-tion Service as PB-200 226-F, \$3.00 in paper copy, \$0.95 in microfiche. April 1971. 44 p, 1 map.

Descriptors: *Pennsylvania, *Earth dams, *Multi-Descriptors: *Pennsylvania, *Earth dams, *Multi-ple-purpose reservoirs, *Dam construction, *En-vironmental effects, Artificial lakes, Lake morphology, Recreation facilities, Damsites, Spill-ways, Outlet works, Acid mine water, Mine wastes, Mine drainage, Alkaline water, Project planning, Project purposes, New York, Flood pro-tection, Water quality control. Identifiers: *Environmental Impact Statements, Tioga County (Pa), *Tioga Lake (Pa), *Hammond Lake (Pa).

Consisting of two dams and two lakes with common outlet works and a spillway, the project is located in Tioga County, Pennsylvania. The proposed project will provide flood control benefits to communities in Pennsylvania and New York and extensive recreational facilities for pic-nicking, camping, boating, swimming, and fishing. The proposed combined outlet works and connecting channel arrangement will make it possible to release alkaline water from Hammond Lake into the acid impoundment of Tioga Lake. Although this will produce a neutralizing effect on the ac impoundment, it would not normally decrease the

degree of acidity to a level that would permit the survival of fish. Unavoidable adverse environmen-tal effects will consist of loss of timber and forest resources, loss of valuable wildlife habitat, loss of resources, loss of valuable wildlife habitat, loss of productive crop and pasture lands at impoundment sites, loss of present hunting and recreational lands, and loss of the aesthetic benefits of free running streams and wooded gorges. The alternatives of single reservoir construction and increased dike height were rejected due to increased cost, transportation and utilities disruption, and inadequate flood control storage. Comments of inadequate flood control storage. Comments of in-terested agencies are included. (Blank-Florida) W72-08343

8E. Rock Mechanics and Geology

A STATISTICAL METHOD FOR THE DESIGN OF ROCK SLOPES, Dames and Moore, Sydney (Australia).

B. K. McMahon

Proceedings, 1st Australia-New Zealand Conference on Geomechanics, Vol. 1, Melbourne, Australia, p 314-321, 12 fig, 15 ref, Aug 1971.

Descriptors: *Statistical analysis, *Slope stability, Joints (Geology), Graphical analysis, Slopes, Probability, Geologic mapping, Cuts, Stability, Open pit mining, Rock mechanics, Rock excavation, Bibliographies.

Identifiers: *Rock slope, *Rock slope stability, Schmidts method, Kinematics, Cut slopes, Slope angles, Stability analysis, Failure surfaces.

Procedures are introduced for designing rock slopes by determining the probability of the slope being undercut by joints, or combinations joints, in unstable orientations. The steps used in the design procedure are: (1) Geologic mapping to divide the area into rock defects and structural regions statistically homogeneous with respect to jointing, (2) representative sampling of the joint orientation of each structural region, (3) statistically analyzing the joint orientation data by using the Schmidt method on a Lambert Equal Area Projection of a sphere, (4) determining the range of joint orientations for which movement is possible, (5) determining the limiting equilibrium method to be used, (6) determining the probability of joints occurring in unsafe orientations for a range of slope angles, and (7) determining the most economical slope angles. An example of the method is presented. (USBR) W72-07919 jection of a sphere, (4) determining the range of

8F. Concrete

AN EXPERIMENTAL STUDY ON THE FLOW MOTION OF FRESH CONCRETE IN SLURRY TRENCH WALL BY ACTIVABLE TRACER, Japan Atomic Energy Research Inst., Tokyo. T. Kawasaki. Takenaka Technical Research Report, No. 6, 16 p,

9 fig, 3 tab, June 1971.

Descriptors: *Concrete construction, *Concrete placing, *Bentonite, *Surries, *Flow, Concrete control, Irradiation, Concrete technology, Foundations, Tracers, Trace elements, Trenches, Detection, Mixing, Analysis. Identifiers: *Slurry trenches, *Tremie concrete, Japan, Selection, Test results.

An experimental study was made to determine the flow motion of fresh concrete when placed in a slurry trench wall by tremie method, and to inve stigate the relation between the strength of the concrete and the amount of bentonite slurry in the concrete and the amount of bentonite starry in the concrete. Several tests were made under various construction conditions and slurry densities using samarium as an activable tracer for checking the introduction of slurry into concrete. Samarium, gold, antimony, and scandium were used for observing the mixing during concrete placement.

Concrete placed through tremie pipes behaves in 2 ways: New concrete either rises above concrete previously placed to cover the old concrete or the new concrete pushes up the concrete previously placed. For the new concrete to push up the old concrete, the insertion of the treme pipe in the concrete must be about 3.5 m from the rising concrete must be about 3.5 m from the rising concrete surface. When concrete replaces bentonite slurry, there is always intermixing of bentonite, although the rate varies. Intermixing of bentonite does not necessarily lower the concrete strength; however, if the slurry contains a large amount of slime, the flowability is impaired and conceivably the intermixing of the sline will lower the concrete strength. (USBR)

8G. Materials

PRACTICAL CORROSION AND INCRUSTA-TION GUIDE LINES FOR WATER WELLS, Universal Oil Products Co., St. Paul, Minn. Johnson Div.

For primary bibliographic entry see Field 04B. W72-08186

INVE: 'IGATION OF MATERIALS AND METHODS FOR USE IN REMOVING SURFACE LAYERS OF OIL ON WATER,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 05G.

INTERNAL CORROSION OF UNLINED WATER MAINS, Black and Veatch, Kansas City, Mo. For primary bibliographic entry see Field 05F.

81. Fisheries Engineering

EFFECTS OF TEMPERATURE AND SALINITY ON GROWTH, FOOD CONVERSION, SUR-VIVAL AND TEMPERATURE RESISTANCE OF JUVENILE BLUE CRABS, CALLINECTES SAPIDUS RATHBUN, Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.

For primary bibliographic entry see Field 02L.

COMMERCIAL FISHERY AND BIOLOGY OF THE FRESHWATER SHRIMP,
MACROBRACHIUM IN THE LOWER ST. PAUL
RIVER, LIBERIA, 1952-53,
National Marine Fisheries Service, Miami, Fla.

Tropical Atlantic Biological Lab. G. C. Miller.

Available from the National Technical Informa-tion Service as COM-71-00655, \$3.00 in paper copy, \$0.95 in microfiche. National Oceanic 2nd Atmospheric Administration Special Scientific Report-Fisheries No. 626, February 1971. 13 p, 8 fig, 7 tab, 15 ref.

Descriptors: *Commercial shellfish, *Fisheries, Shrimp, Fish harvest, Commercial fishing, Aquatic population. Identifiers: *Freshwater shrimp, Macrobrachium spp., Shellfish populations, *St Paul River,

Shellfish populations,

A small trap fishery was conducted for the large commercial freshwater shrimp Macrobrachium vollenhovenii. A smaller species, M. macrobrachion was culled from the trap catch for the fishermen's private use. The estuarine fishery was seasonal (May to January), during the normal low salinity periods. Cost of raw tail meats to the consumer was over \$1.00 (U.S.) per pound. Fisher-men derived more than \$7,500 from the fishery.

The life cycles of these species are reviewed. Monthly length distributions indicated that the fishery was supported by age group one, which was replaced at the end of the season by age group zero. (Svensson-Washington)
W72-08445

SAN MARCOS NATIONAL FISH HATCHERY, HAYS COUNTY TEXAS (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Bureau of Sport Fisheries and Wildlife, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-199 463F, \$3.00 in paper copy, \$0.95 in microfiche. 1971. 8 p, append.

Descriptors: Water pollution sources, Water pollution effects, *Fish hatcheries, *Fish management, Fisheries, Fish reproduction, Aquifer management, *Environmental effects, Warm-water fish,

Identifiers: *Environmental impact statement, San Marcos (Tex).

The proposed San Marcos installation is to serve as a national fish hatchery and development center for testing and evaluating new fish rearing techniques. Production is scheduled to begin in fiscal year 1973 with maximum production levels reached in 1976. The alternative of enlarging existreached in 1976. The alternative of enlarging existing hatcheries was not considered practical because of limited land and water supplies. The 126 acre complex will be located approximately 2 miles southwest of San Marcos in Hays County, Texas. Facilities will include a complex of 52 ponds, associated drain and supply lines buildings, and water treatment and recirculation system. Two wells located approximately 0.5 mile from the hatchery site will supply water from the Edwards Limestone Aquifer. The hatchery will comply with federal and state water quality standards. There will be no adverse effects upon will dards. There will be no adverse effects upon wil-dlife at the hatchery site. (Svensson-Washington)

RESERVOIR FISHERIES AND LIMNOLOGY.

American Fisheries Society Special Publication, No. 8, Washington, D. C., 1971. G. E. Hall, editor, 511 p. Illus. Maps. Pr. \$14.00. Identifiers: Benthos, *Fisheries, Limnology, Phytoplankton, *Reservoirs, Management, Fish reproduction, Organic matter, Sport fish.

This collection includes a cross-section of current This collection includes a cross-section of current activities in the field of limnology and reservoir fisheries and provides a sequel to the April 1967 Reservoir Fishery Resources Symposium. Solutions to reservoir problems were sought from many angles. Ten papers in the first section deal with vital facets of the life cycle of important reservoir fishes. Life history data provide a template of the sequential stages occurring in a population which permits meaningful interpretation of quantitative population measurements. Eight quantitative population measurements. Eight papers in the limnology section deal with papers in the imminogy section deal with physicochemistry, organic matter, phytoplankton, aquatic macrophytes and benthos-the productivity bases on which reservoir fish populations are dependent. Management evaluation papers describe the success or failure of management techniques in sport fishery harvest. Papers in the section on population dynamics and environmental relationships exemplify attempts to bring fresh perspectives to reservoir fishery research by developing more powerful sampling methods and mathematical tools. These findings should provide greater insight in interpreting population dynamics data and more critical appraisals of the assumptions on which long-standing production theories have been based. The concluding paper provides a global review of knowledge on reservoir fish parasitology. Contributions include bibliographies and are illustrated by maps, charts and line drawings.-Copyright 1972, Biological Abstracts, Inc. W72-08474

09. MANPOWER, GRANTS AND FACILITIES

9B. Education (In-House)

MANFORCE, A PROGRAM OF THE WATER POLLUTION CONTROL FEDERATION, Water Pollution Control Federation, Washington, For primary bibliographic entry see Field 05D. W72-08360

9C. Research Facilities

ANNUAL REPORT, 1971. Institute for Water Resources (Army), Alexandria,

Army Corps of Engineers Institute for Water Resources Annual Report, 1972. 28 p, 4 append.

Descriptors: "Research and development, "Water resources institute, "Planning, "Water resources development, "Cost-benefit analysis, Water management (Applied), Flood control, Water supply, Water quality, Hydraulics, Navigation, Recreation, Reservoirs, Canals, Dams, Laboratories, Model studies Identifiers: *Army Corps of Engineers.

Accomplishments and activities of the Corps of Engineers Institute for Water Resources for the Calendar Year 1971 are described. The work of the Institute has provided the bases for significant im-Institute has provided the bases for significant improvements to Corps water resources planning. During the year, emphasis was placed upon improving exchanges of information and views on planning research, relating research more closely and more clearly to Corps planning needs, and expanding long range planning and planner training activities. The work of the Institute in 1971 interesting activities of the control of the c cluded studies of the planning process (general), future assessment, ex post analysis of planning, distribution of benefits and costs, flood plain management, environmental and social considera-tions, navigation, flood control, water supply and water quality, recreation, and special planning for deep draft ports. (Knapp-USGS)

FLOATING LABORATORY FOR STUDY OF AQUATIC ORGANISMS AND THEIR EN-VIRONMENT,

National Marine Fisheries Service, Seattle, Wash. G. R. Snyder, T. H. Blahm, and R. J. McConnell. Available from the National Technical Informa-tion Service as COM-71-00785, \$3.00 in paper copy, \$0.95 in microfiche. Circular 356, May 1971. 16 p, 11 fig.

Descriptors: *Research facilities, *On-site labora-tories, Laboratories, Aquatic environment, Aquatic life.

Identifiers: *Floating laboratory, Aquatic organ-

A floating laboratory to study environmental problems near sites where they are expected to occur has been built. The facility was assembled on a surplus barge acquired from the U.S. Navy. The barge is 32 ft x 110 ft in outside dimensions. A 26 ft x 80 ft metal building on the main deck has been converted to a fish holding room, two wet labs, a biological lab, a chemistry lab, and office space. Four of six ballast compartments below deck were converted into maintenance shores and deck were converted into maintenance shops and to storage and work spaces. Two compartments-one forward and one aft— are used for ballast. About 6,000 square feet of floor space on the two decks is available. The facility provides a stable platform and, with water storage tanks full, draws only 4 ft of water. Water and electrical systems render the facility self sufficient. (Svensson-Washington) W72-08244

Field 09-MANPOWER, GRANTS AND FACILITIES

Group 9C—Research Facilities

NATIONAL ENVIRONMENTAL CENTER ACT OF 1972. Washington, D.C.; and House, Washington, D.C.

For primary bibliographic entry see Field 06E. W72-08323

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

WATER QUALITY CRITERIA DATA BOOK, VOL. 1 - ORGANIC CHEMICAL POLLUTION OF FRESHWATER. Little (Arthur D.) Inc., Cambridge, Mass.

For primary bibliographic entry see Field 05C. W72-08157

WATER QUALITY CRITERIA DATA BOOK, VOLUME 2 - INORGANIC CHEMICAL POLLU-TION OF FRESHWATER.

Little (Arthur D.) Inc., Cambridge, Mass. For primary bibliographic entry see Field 05C.

AN ANNOTATED BIBLIOGRAPHY OF THE MASTERS THESES AND DOCTORAL DISSER-TATIONS ON WATER RESOURCES AND THEIR USES, 1930-1970, Massachusetts Univ., Amherst. Water Resources

Research Center.
J. A. McCann, and G. G. Smith.

Available from the National Technical Information Service as PB-209 210, \$3.00 in paper copy, \$0.95 in microfiche. Massachusetts Water Resources Research Center Report, 1971. 47 p. OWRR A-999-MASS (9).

Descriptors: *Water resources, *Bibliographies, *Iniversities, *Mas-*Technical writing, *Universities, *Mas-sachusetts, Reviews, Documentation, Abstracts. Identifiers: *Theses, *Dissertations, *University of Massachusetts.

An annotated bibliography of 302 masters theses An annotated biolography of 302 masters theses and doctoral dissertations on water resource subjects completed at the University of Massachusetts from 1930 to 1970 is presented. A departmental and subject index is included. The theses are listed in alphabetical order by author within each university department and by subject matter. (Woodard-USGS)
W72-08200

AFFAIRS BIBLIOGRAPHY, SELECTED LIST EMPHASIZING INTERNA-TIONAL LAW, POLITICS AND ECONOMICS OF OCEAN USES. For primary bibliographic entry see Field 06E.

A BIBLIOGRAPHY. THE CASPIAN SEA. (KASPIYSKOYE MORE. REFERATIVNYY SBORNIK),

Akademiya Nauk SSSR, Moscow. Vsesoyuznyi Institut Nauchnoi i Tekhnicheskoi Informatsii. For primary bibliographic entry see Field 02H. W72-08424

10C. Secondary Publication **AND Distribution**

W72-08238

W72-08410

WATER RESOURCES INVESTIGATIONS IN KENTUCKY, 1972. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

WATER RESOURCES INVESTIGATIONS IN MASSACHUSETTS, 1968.
Geological Survey, Washington, D.C.
For primary hibliographic entry see Field 07C. W72-08411

SELECTED TERMS IN FISH CULTURE.
Food and Agriculture Organization of the United Nations, Rome (Italy). Terminology and Nations, Kome (Italy). Terminology Reference Section. For primary bibliographic entry see Field 07C. W72-08414

10F. Preparation of Reviews

MICROBIOLOGICAL ASPECTS OF THE POL-LUTION OF FRESH WATER WITH INOR-GANIC NUTRIENTS, Wisconsin Univ., Madison. Dept. of Soil Science; and Edinburgh Univ. (Scotland). Dept. of Microbiology Microbiology.
For primary bibliographic entry see Field 05C.
W72-07933

A REVIEW OF THE FACTORS LIMITING THE GROWTH OF NUISANCE ALGAE, Michigan Water Resources Commission, Lansing. For primary bibliographic entry see Field 05C. W72-07937

RECLAMATION OF PONDS, LAKES, AND STREAMS WITH FISH TOXICANTS: A REVIEW, Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab. For primary bibliographic entry see Field 05C. W72-08059

CADMIUM IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL AP-PRAISAL, Karolinska Institutet, Stockholm, (Sweden). Dept. of Environmental Hygiene. For primary bibliographic entry see Field 05C. W72-08062

WASTEWATER TREATMENT TECHNOLOGY, Illinois Inst. for Environmental Quality, Chicago. For primary bibliographic entry see Field 05D. W72-08147

CRITICAL REVIEW OF SEDIMENT TRANS-PORT EXPERIMENTS, Alberta Univ., Edmonton. Dept. of Civil Engineer-For primary bibliographic entry see Field 02J. W72-08199

ANALYTICAL METHODS IN OCEANOG-RAPHY. I. INORGANIC METHODS, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05A.

WATER SUPPLY AUGMENTATION BY WATERSHED MANAGEMENT IN WILDLAND AREAS,
Pennsylvania State Univ., University Park. School of Forest Resources. For primary bibliographic entry see Field 03B. W72-08384

THE FATE OF NITROGEN IN AQUATIC ECOSYSTEMS, Wisconsin Univ., Madison. Water Resources Center. For primary bibliographic entry see Field 05C. W72-08459

SUBJECT INDEX

1969 BRUSSELS CONFERENCE Reflections on Brussels: Imco and the 1969 Pollution Conventions,	Physical-Chemical Treatment of a Municipal Wastewater Using Powdered Activated Car- bon.	Evaluation of an Ozonation-Activated Carbon Treatment for a Colored Industrial Waste, W72-08156 5D
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toir Wastewater,		bon.
W72-08399 5D	Liquid Waste Treatment Process,	W72-08353 5D
ARY APPLAN	W72-08176 5D	W 72-08333
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Mercury Concentrations in Museum Specimens	W72-08283 5D	Operational Experience at a Petro-Chemical
of Tuna and Swordfish,		Manufacturing Wastewater Treatment Plant,
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources
 of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
 - WATER QUANTITY MANAGEMENT AND CONTROL
 - WATER QUALITY MANAGEMENT AND PROTECTION
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